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The category "Patents" has been discontinued. Beginning with this issue, abstracts of patents will be categorized by subject content. Patents will continue to be identified in the subject index by the letter "P".

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NUCLEAR SCIENCE ABSTRACTS

Volume 13 Number 10 May 31, 1959

GENERAL

8479 BNL-523
Brookhaven National Lab., Upton, N. Y.
ANNUAL REPORT, JULY 1, 1958. Feb. 1959. 201p.
Contract AT-30-2-GEN-16. $3.50(OTS).

This annual report of Brookhaven National Laboratory describes its program and activities for the fiscal year 1958. The progress and trends of the research program are presented along with a description of the operational, service, and administrative activities of the Laboratory. The scientific and technical details of the many research and development activities are covered more fully in scientific and technical periodicals and in the quarterly scientific progress reports and other scientific reports of the Laboratory. A list of all publications for July 1, 1957 to June 30, 1958, is given. Status and progress are given in fields of physics, accelerator development, instrumentation, applied mathematics, chemistry, nuclear engineering, biology, and medical research. (For preceding period see BNL-462.) (W.D.M.)

8480 NP-7255
Collège de France, Paris. Laboratoire de Physique et Chimie Nucléaires.
ANNUAIRE DU LABORATOIRE. ANNEE 1957–1958. (Laboratory Annual Report. Year 1957–1958.)
Frédéric Joliot. 10p.

A brief survey is given of the investigations made at the Laboratory of Nuclear Chemistry and Physics of the College of France. No results are given. The publications by staff members are tabulated. (J.S.R.)

8481 NP-7256
Paris. Université. Institut du Radium. Laboratoire Curie.
ANNUAIRE DU LABORATOIRE. ANNEE 1957–1958. (Laboratory Annual Report. Year 1957–1958.)
F. Joliot, M. Haissinsky, J. Teillac, and G. Bouissieres. 13p.

A brief survey is given of the investigations made at the Curie Laboratory of the Radium Institute. No results are given. The publications of staff members are tabulated. (J.S.R.)

8482
RADIOAKTIVE ISOTOPE IN DER DICKENMESSUNG. (Radioactive Isotopes in Thickness Measurement).
H. Hart and E. Karstens. Berlin, Veb Verlag Technik, 1958. 298p.

A survey, intended for the engineer and others working with thickness and area measurements, is presented of the use of radioisotopes in this field. The topics discussed include methods of thickness and area measurements, fundamentals from nuclear physics, radiation sources for thickness measurements, measurement of radioactive radiation, the principle of thickness measurements with radioisotopes, description of some commercially produced thickness measuring instruments, application examples for area measurements, reasons for wrong measurements and economic considerations, and protection in the use of radioisotopes. 288 references. (J.S.R.)

8483
VERSCHLEISSUNTERSUCHUNGEN MIT HILFE RADIOAKTIVER ISOTOPE. (Wear Investigations with Radioisotopes). Gerd Fleischer, ed. Translation of "Izuchenie Iznosa Detalei Mashin Pri Pomoshchi Radioaktivnykj Izotopov. P. E. D'Yachenko, ed." Berlin, Veb Verlag Technik, 1958. 129p.

A compilation of fifteen articles on the use of radioisotopes in investigations of wear in machines is presented. Six articles are concerned with the experimentally observed regularities in wear. A new research arrangement for the investigation of sliding parts with forced lubrication with lubricants of low viscosity is described. A method for the determination of the actual contact surface of moving parts is given. Methodical questions on the applications of radioisotopes are considered in four articles. In two articles the application of autoradiography in the investigation of metal wear is discussed. The properties of lubricants in decreasing wear are described. The question of protection in work with radioisotopes is discussed in two articles. (J.S.R.)

8484
DEFENSE AGAINST RADIOACTIVE FALLOUT ON THE FARM. Farmers' Bulletin No. 2107. Washington, U. S. Department of Agriculture, 1958. 16p. Available from U. S. Government Printing Office, Washington for $0.10.

A summary of the recommendations of scientists, engineers, public health officials, civil defense authorities, and other specialists on how to cope with fall-out is presented. The bulletin contains information regarding the reasons for fall-out danger, the limits of a fall-out area, and the time interval of fall-out danger. Fall-out effects on live stock as well as land and crops are examined. Finally suggestions on what to do now, what to do with a few months warning, a few hours warning, and during and after fall-out are discussed. (J.R.D.)

8485
PROGRESS IN NUCLEAR ENERGY. SERIES X. LAW AND ADMINISTRATION. VOLUME 1–2. Herbert S. Marks, ed. New York, Pergamon Press, 1959. 1005p. $26.50.

This volume presents authoritative review articles on the legal and administrative aspects of nuclear energy. Volume one presents leading articles on law and administration relating to nuclear energy. Volume two, part one, presents legislation and administrative procedures and practices in various countries. Part two of this same volume discusses international agencies and typical bilateral agreements. (W.L.H.)

BIOLOGY AND MEDICINE

8486 ACRH-8
Argonne Cancer Research Hospital, Chicago.
SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. STUDIES ON ERYTHROPOIESIS. Leon O. Jacobson and Antreen Pfau, eds. Sept. 1957. 156p. Contract AT(11-1)-69. $3.00(OTS).

Progress is reported in studies directed toward an understanding of the mechanism of control of red blood cell formation. A relatively rapid and sensitive method of assay for erythropoietin was developed, using the rate of incorporation of iron-59 into the red cells of normal, hypophysectomized, or starved rats as a measure of the rate of erythropoiesis. Factors that control erythropoiesis through control of production of erythropoietin were studied. The effect of erythropoietin in initiating marrow activity was demonstrated in mice having a completely suppressed marrow as far as red cell formation is concerned. Data are reported from studies on the effect of cobalt in polycythemia, the site of erythropoietin production, the clinical significance of erythropoietin, the production of erythropoietin by fetuses in utero, the effect of erythropoietin on iron absorption, and the properties of erythropoietin isolated from plasma. A list of publications during the period is included. (C.H.)

8487 ACRH-10
Argonne Cancer Research Hospital, Chicago.
SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Leon O. Jacobson, ed. and Frances J. Skozen, comp. Sept. 1958. 115p. Contract AT(11-1)-69. $2.50(OTS).

Progress is reported in the following studies: the degradation of uric acid in man; the effect of triiodothyronine on the oxidative metabolism of erythrocytes; the biosynthesis of abnormal proteins in multiple myeloma; tracer studies on the metabolism of DL-glutamic acid in man; the effect of triiodothyronine on radiosensitivity of rats; the physiologic and clinical significance of erythropoietin; the measurement of isodose distributions from a revolving beam cobalt-60 therapy unit; tracer studies of protein binding and subcellular localization of digitoxin; applications of carbon-14 in metabolic studies; and tracer studies on the metabolism of progesterone. A list of publications during the period is included. (C.H.)

8488 AECU-3774
Massachusetts Inst. of Tech., Cambridge. Radioactivity Center.
RADIUM AND MESOTHORIUM POISONING AND DOSIMETRY AND INSTRUMENTATION TECHNIQUES IN APPLIED RADIOACTIVITY. Annual Progress Report. May 1958. 187p. Contract AT(30-1)-952. $3.00(OTS).

The study of the toxicity of radium and radium decay products was continued. Special emphasis was placed on the acquisition of data on patients selected by record of exposure. Data are tabulated on the radium body burden of about 40 individuals. About half the measurements were made on living persons and about half on tooth or bone specimens. Case history summaries and all available medical data are summarized for persons under study. An investigation of the gamma shielding properties of dunite was continued. Design modifications and calibration of radiation detection instruments are discussed. (For preceding period see AECU-3504.) (C.H.)

8489 AECU-4020
Dartmouth Coll., Hanover, N. H.
THE OCCURRENCE OF NATURAL ROOT GRAFTING IN EASTERN WHITE PINE, PINUS STROBUS L., AND ITS ECOLOGICAL IMPLICATIONS. F. H. Bormann and Ben F. Graham, Jr. [1959]. 35p. Contract AT(30-1)-2037. $6.30(ph), $3.00(mf) OTS.

A study of intraspecific root grafting in white pine was made. A technique for detecting root grafts by a tracer method is described. Results indicate that root grafting occurs in white pine stands from 15 to 71 years of age, and probably in both younger and older stands. Grafting occurs under a wide range of site conditions from bogs to dry sites. Fusion may be limited to a single graft between trees, but often sizable clusters of trees are organically united by an extensive complex of self-grafts and intraspecific grafts. The degree of grafting in any stand is probably related to the age, density, and purity of the stand; also certain ecotypes may be more prone than others to the establishment of grafts. Roots of seemingly dead trees often remain alive through grafts to living trees; this kind of multigenotypic entity is apparently common in many pine communities. Many grafts are functional in the translocation of food, minerals, and water. Translocation of food was evidenced by the maintenance of growth in old living stumps. The translocation of water and minerals was demonstrated by the movement of dye and radioisotopes from tree to tree, from freshly cut stumps to trees, and from old living stumps to trees; preliminary tests indicate that as P-32 injected into a root moves toward a tree, some of it may be diverted to another tree through a root graft. Some grafts may not function in translocation, as was shown by the failure of dye to move from cut stumps to adjacent trees known to be grafted to the stump. Possible explanations for this behavior are that movement through some grafts may occur only in one direction, that some grafts may function only in time of stress, or that some grafts may be truly nonfunctional. It is suggested that in some instances grafted trees may behave as parts of an organic union, rather than as individuals in competition with each other. The number of reports of natural root grafting in many forest tree species suggests that the observations here reported and their ecological implications are not limited to white pine. (auth)

8490 AF-SAM-58-147
Texas. Univ., Austin. Radiobiological Lab.
NOVELTY LEARNING SETS IN RHESUS MONKEYS. W. Lynn Brown, John E. Overall, and H. C. Blodgett. June 20, 1958. 5p.

Thirty-three rhesus monkeys, 7 normal, 13 given low-dose radiation, and 13 given high-dose radiation, were presented with 12 object-quality discrimination problems each day for 16 days. Four trials were allowed on each problem. Each problem involved one new novel stimulus and one stimulus which had appeared in the preceding problem. Half the time, the stimulus

brought forward had been positive (rewarded) and half the time negative (nonrewarded) in the preceding problem. In each problem, the new or novel stimulus was made positive (rewarded) and the stimulus retained from the preceding problem, regardless of previous sign, became negative. The monkeys attained significant first-trial solution of the successive problems. Previous exposure to whole-body radiation did not produce significant differences in performance in this experiment. A significantly greater likelihood of error resulted when the positive stimulus was retained with reversed sign than when the negative stimulus was retained without reversed sign. The relative difficulty of the positive-brought-forward with reversal and the negative-brought-forward without reversal was found to depend on the degree of training. (auth)

8491 CF-59-1-35
Oak Ridge National Lab., Tenn.
DETECTION OF ThO_2 CONTAMINATION IN SIMULATED CUTS AND ABRASIONS. D. G. Thomas and J. V. Hilyer. Jan. 15, 1959. 24p. Contract W-7405-eng-26. $4.80(ph), $2.70(mf) OTS.

Tests have been made to determine the sensitivity of various radiation detection instruments for known amounts of ThO_2 contained in simulated cuts and abrasions. A shielded Geiger-Mueller counter tube can be expected to detect at least 0.1 mg ThO_2 when counting for a reasonable length of time provided the ThO_2 deposit is on the surface of the subject being counted. A shielded gamma-spectrometer-crystal, set at a 50-kev cutoff, can be expected to detect at least 0.5 mg ThO_2 even when an absorber equivalent to $\frac{1}{2}$ in. of paraffin is placed between the crystal and the ThO_2 sample. Duration of exposure of standard film badge photographic emulsions is inversely proportional to the amount of material present and an exposure of about 300 hr is required to detect 10 mg of surface ThO_2. Although no information is available on the amount of thorium required to induce fibrosarcomas, an extrapolation of data for plutonium indicates that of the order of $\frac{1}{2}$ gram of thorium must be present before occurrence of fibrosarcomas would be observed. This value does not represent a lower limit but is more likely to be a value for which occurrence of fibrosarcomas are a virtual certainty. It appears to be most desirable to experimentally determine the lower limit value for the amount of ThO_2 required to induce fibrosarcomas, noting that this may be as much as a factor of 100 smaller than the value cited above. (auth)

8492 HW-8944
Hanford Works, Richland, Wash.
SOME EFFECTS OF PILE AREA EFFLUENT WATER ON YOUNG SILVER SALMON. A Description of Experiments Carried Out at the Fish Laboratory Between December 6, 1946 and October 20, 1947. P. A. Olson, Jr. Feb. 17, 1948. Decl. Aug. 21, 1958. 21p. Contract [W-31-109-Eng-31]. $4.80(ph), $2.70(mf) OTS.

Results are presented from a study of the effects of area effluent water on the mortality and development of silver salmon eggs, fry, and fingerlings. Data are tabulated for various concentrations of effluent in Columbia River water. (C.H.)

8493 HW-11662
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
THE ACCUMULATION OF RADIOACTIVITY AS SHOWN BY A LIMNOLOGICAL STUDY OF THE COLUMBIA RIVER IN THE VICINITY OF HANFORD WORKS. Preliminary Report. R. W. Coopey. Nov. 12, 1948. Decl. July 25, 1952. 14p. $3.30(ph), $2.40(mf) OTS.

The radioactivity present in bottom-living organisms of the Columbia River was investigated at nine stations in the vicinity of the Hanford Works from November 1947 to April 1948. The activity accumulated by a variety of organisms was approximated both for dilution of pile effluent water as found in the river and for higher concentrations under laboratory conditions. Data are tabulated. Considerable variation in concentrating ability was noticeable, with some insect larvae and Crustacea running high. A list is included of common plankton genera present in the river. (C.H.)

8494 HW-11344
Hanford Works, Richland, Wash.
A ONE YEAR STUDY OF RADIOACTIVITY IN COLUMBIA RIVER FISH. K. E. Herde. Oct. 25, 1948. Decl. Feb. 19, 1957. 11p. Contract [W-31-109-Eng-52]. $3.30(ph), $2.40(mf) OTS.

Results are presented from a survey of the radioactivity in Columbia River fish collected between April 1947 and April 1948. Algae samples were also collected at the same time as the fish samples and were assayed for radioactivity. Results are presented on the beta activity in 194 fish. Procedures and results are discussed. (C.H.)

8495 NP-7271
Texas. Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD. Progress Report [for] September 1, 1954 to January 1, 1955. L. R. Richardson. 7p. Contract DA-49-007-MD-582.

Data are summarized from studies on the effects on offspring of an irradiated diet consumed by the mother, the effects of an irradiated diet on the life span of rats, and the effects of irradiation of the diet on the folic acid content using chicks as experimental animals. (C.H.)

8496 NP-7274
Texas. Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD. Progress Report No. IV [for] July 1, 1955 to October 1, 1955. L. R. Richardson. 12p. Contract DA-49-007-MD-582.

Observations are summarized on the reproductive ability, longevity, and incidence of blindness in the first, second, and third generation of rats maintained on a diet of irradiated food. Results indicate that the fertility of the females is not associated with irradiation of the diet. Rats on the untreated diet grew slightly faster than those on the irradiated diet, and the incidence of blindness in young rats was higher in the group on the irradiated diet. Results from feeding studies with chicks indicate that irradiation destroys practically all of the vitamin K activity even when large amounts of the vitamin are present. The effect of irradiation on fat-soluble vitamins, protein, and B-vitamins was studied. The folic acid content of the liver of chicks receiving various irradiated and untreated diets was measured. Data are tabulated. (C.H.)

8497 NP-7275
Texas. Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD. Prog-

ress Report No. V [for] October 1, 1955 to January 1, 1956. L. R. Richardson. 19p. Contract DA-49-007-MD-582.

Data are reported from observations on four generations of rats maintained on irradiated and untreated diets. As measured by the number and percent of young weaned, the irradiated diet was equal to the untreated diet for reproduction and lactation in the first and second generation. The irradiated diet was inferior to the untreated diet in the third generation. The diets had equal effects on life span; however, most of the rats on untreated diet grew slightly faster than those receiving the irradiated diet. Chicks receiving an irradiated diet supplemented with vitamins A, D, and E consistently grew at a slightly slower rate than those receiving the untreated diet. When the complete diet was irradiated with no vitamin supplement added, the chicks grew slowly and mortality was high. Fat, protein, and a mixture of 10 B-vitamins were irradiated separately in an attempt to locate the component of the diet affected by irradiation. Results show that the fat and the mixture of 10 B-vitamins, when low in moisture, were not affected by irradiation of the diet. The nutritive value of casein did not appear to be decreased by irradiation. Irradiated gelatin appeared to be inferior to untreated gelatin. Data are included from studies to determine the effects of irradiation on individual vitamins and enzymes. (C.H.)

8498 NP-7277

Texas. Agricultural Experiment Station, College Station.

A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD. Progress Report No. VII [for] April 1, 1956 to July 1, 1956. L. R. Richardson. 23p. Contract DA-49-007-MD-582.

Data are summarized from studies extending over a two-year period on the effects of an irradiated diet on weight, reproduction, and mortality of rats and chicks. The effects of various amounts of irradiated and non-irradiated B vitamins were also studied in chicks maintained on an irradiated diet. Results of a study on the effects of radiation on B vitamins in aqueous solutions indicate that irradiation destroys a large portion of the activity of thiamine and of pantothenic acid. (C.H.)

8499 RDB(W)/TN-187

United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.

THE UPTAKE OF ZIRCONIUM^{95} AND NIOBIUM^{95} BY PORPHYRA SP. E. E. Foreman and W. L. Templeton. Feb. 1955. 15p.

Experiments carried out on the uptake of Zr^{95} and Nb^{95} by the edible seaweed, Porphyra umbilicalis, show that when the activity of the seawater is maintained at a constant level of 8.65×10^{-3} $\mu c/ml$, concentration factors of 336 for zirconium and 435 for niobium are reached after 34 days. With the water activity constant at the lower level of 9.5×10^{-4} $\mu c/ml$, the concentration factors for zirconium are 200 after 34 days and 230 after 73 days, and for niobium 420 after 34 days and 470 after 73 days. The release of zirconium and niobium was studied by placing drums of activated weed on the shore. Fifty per cent of the activity is lost after 6 days and 96 per cent after 65 days. The mode of uptake and methods of analysis are discussed. (auth)

8500 TID-7554

Brookhaven National Lab., Upton, N. Y.

PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. (Issued in two books: (Bk. 1), 363p. and (Bk. 2), 250p.). $6.00(OTS).

Separate abstracts have been prepared on 41 sections of this report. (C.H.)

8501 TID-7554(p.11-24)

Atomic Energy Commission, Washington, D. C.

PEACEFUL USES OF ATOMIC ENERGY. Willard F. Libby. p.11-24 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 14p.

Developments in peaceful uses of atomic energy are reviewed. Industrial applications discussed include uses of radioisotopes as oil pipe line markers, beta thickness gages, other thickness and density gages, industrial radiography, oil-well beneficiation and refinery uses, radiation sources, and agricultural research. Developments in the nuclear power program are summarized. The development of new industries engaged in the production, processing, and distribution of radioisotopes and radiation-measuring instruments is discussed. Medical uses of radioisotopes for diagnosis and therapy are reviewed. Applications of data from military weapons tests in studies of ground water distribution are summarized. It was learned that only a little over one-half of the rain falling in an inland area such as the Mississippi Valley comes from the ocean, the rest being reevaporated ground water. The average time spent on the continent by water rained out in the Mississippi Valley was calculated to be 20 years, and it was learned that the rivers account for only two-thirds of the total water rained out from the sea. The atom is declared to be one of our richest frontiers which, if developed wisely, can give us material benefits almost without end. (C.H.)

8502 TID-7554(p.199-221)

Oak Ridge National Lab., Tenn.

THE NATURE OF REACTOR TECHNOLOGY AND REACTOR DEVELOPMENT. A. M. Weinberg. p.199-221 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 23p.

Advances in reactor technology are reviewed. Various philosophies of reactor development are examined. The status of various projects in the current United States reactor development program is used to exemplify these divergent views. (C.H.)

8503 TID-7554(p.222-8)

General Nuclear Engineering Corp., Dunedin, Fla.

PROBLEMS IN THE CONSTRUCTION AND OPERATION OF POWER REACTORS. W. H. Zinn. p.222-8 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

The principal problem in the generation of electricity is an economic one. Reactors are described that could be built now or in the near future for power production. Design and operating characteristics are discussed. (C.H.)

8504 TID-7554(p.229-34)

New York Univ., New York.

RESEARCH REACTORS. L. B. Borst. p.229-34 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPO-

SIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 6p.

A research reactor must be convenient, available, and have a high degree of flexibility to meet the varied needs of scientists who will use it. Location is one of the paramount considerations in planning a research reactor. Problems of safety are discussed. Design features of research reactors in use and under construction in the United States in 1957 are reviewed. (C.H.)

8505 TID-7554(p.235-9)
Atomic Energy Commission, Washington, D. C.
CRITERIA FOR SELECTION OF SITES FOR NUCLEAR REACTORS. C. K. Beck. p.235-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 5p.

Problems are discussed which must be considered in the selection of a site for a nuclear reactor. Safety is the prime consideration, and factors which contribute to safety are discussed in detail. Procedures for site selection are outlined. (C.H.)

8506 TID-7554(p.240-52)
Brookhaven National Lab., Upton, N. Y.
RADIATION SAFETY IN A RESEARCH LABORATORY. F. P. Cowan. p.240-52 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 13p.

In planning and executing research work involving radioactive materials, emphasis must be placed on radiation safety. The need to do so arises from the fact that radioactive materials are extremely toxic as compared with nonradioactive poisons, and the radiations they emit produce no sensory response in the body even for lethal exposures. The health physics program in a large laboratory is outlined, and many aspects of health physics are discussed. (C.H.)

8507 TID-7554(p.253-9)
National Science Foundation, Washington, D. C.
RADIATION INSTRUMENTATION. R. L. Butenhoff. p.253-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

Characteristics of some of the more familiar types of radiation detection instruments are compared. Some recent developments are reviewed. (C.H.)

8508 TID-7554(p.260-92)
Brookhaven National Lab., Upton, N. Y.
RADIOISOTOPE FACILITIES ASSOCIATED WITH A RESEARCH REACTOR. L. G. Stang, Jr. p.260-92 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 33p.

Typical operations that are encountered in handling radioactive material in a radiochemistry laboratory are outlined. Techniques, facilities, and equipment are described and illustrated. 27 figures. (C.H.)

8509 TID-7554(p.293-9)
Battelle Memorial Inst., Columbus, Ohio.
RADIOISOTOPE TECHNIQUES. G. D. Calkins. p.293-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

Industrial applications of radioisotopes result in a saving of over one-third of a billion dollars a year to American industry. Applications of radioisotopes discussed include use in determinations of the penetration of moisture into protective coatings, in studies of the distribution of rare-earth additions in steel, and in determinations of the wearing qualities of grinding balls. (C.H.)

8510 TID-7554(p.300-5)
Atomic Energy Commission, Washington, D. C.
ISOTOPES IN INDUSTRY. P. C. Aebersold. p.300-5 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 6p.

The industrial usefulness and potentials of radioisotopes are discussed. Examples described include the following applications: gaging of materials; quality control; industrial radiography using gamma sources such as cobalt-60, iridium-192, or cesium-137, tracer applications as moving-markers, in leak detectors, in wear and corrosion studies, and in the evaluation of protective coatings; for adding energy to chemical systems; in the preparation of long-chain polymers; cracking or degradation of organic molecules; in the vulcanization and curing of elastomers and plastomers; in the preservation of foods; and in the sterilization of drugs and pharmaceuticals. Use of radioisotopes which are particularly adaptable to Latin American industries include: density gages for use in the tobacco industry; in the sugar industry as gages to measure continuously the weight of bagasse; in the rubber industry for measuring various aspects of the manufacturing products, including tire fabrics; in the manufacture of paper and other thin-sheet products; and in the oil industry for a number of uses. (C.H.)

8511 TID-7554(p.306-17)
Little (Arthur D.) Inc., Cambridge, Mass.
RADIATION SOURCES AND FACILITIES. R. P. Epple. p.306-17 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 12p.

Various sources of radiation are described which have proved to be most useful and reliable. Technical and economic factors which affect the choice of a radiation source for a research laboratory or a production facility are reviewed. (C.H.)

8512 TID-7554(p.318-24)
Brookhaven National Lab., Upton, N. Y.
CHEMICAL APPLICATIONS OF RADIATION. B. Manowitz. p.318-24 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

Radiation is proving to be a good tool with which to study reaction mechanisms. Results are summarized from studies in which radiation was used as a catalyst and studies on the effects of radiation on polymers. (C.H.)

8513 TID-7554(p.326-31)
Concepción, Chile. Universidad.
HETEROGENEOUS EXCHANGE IN THE METHYL IODIDE–IODINE SYSTEM. H. Behrens. p.326-31 [of]

PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 6p.

Results are reported from a study of energy levels in exchange reactions in the methyl iodide–iodine system. The effects of gamma radiation on a radiation-induced exchange were also studied. Data are presented graphically. (C.H.)

8514 TID-7554(p.334-56)
Brookhaven National Lab., Upton, N. Y.
PANEL DISCUSSION OF NUCLEAR ENGINEERING SUBJECTS. M. Fox and C. Williams. p.334-56 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 23p.

The status of the development of research reactors is reviewed. The status of developments in liquid-metal-fuel reactor systems is summarized. Engineering problems in the development of power reactors are discussed. (C.H.)

8515 TID-7554(p.359-66)
Argonne National Lab., Lemont, Ill.
BIOLOGICAL EFFECTS OF RADIATION. H. M. Patt. p.359-66 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 8p.

Present studies in the field of radiobiology are reviewed. Physical, biochemical, and physiological aspects of the field are discussed. (C.H.)

8516 TID-7554(p.367-9)
Argonne Cancer Research Hospital, Chicago.
RADIOBIOLOGICAL HAZARDS AND SAFETY. R. J. Hasterlik. p.367-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 3p.

The biological hazards of radiation are reviewed. The operation and duties of each division concerned with radiological safety are outlined. The need is stressed for cooperation between medical, radiological physics, bioassay, and industrial hygiene groups in assuring radiological safety. (C.H.)

8517 TID-7554(p.370-1)
Columbia Univ., New York. Coll. of Physicians and Surgeons.
THE BIOSYNTHESIS OF PORPHYRINS. D. Shemin. p.370-1 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 2p.

The pathway of porphyrin biosynthesis is presented as elucidated by the use of radioactive compounds. The origin of each of the carbon atoms of protoporphyrin, the methyl group of acetic acid, the carboxyl group of acetic acid, and the alpha atom of glycine was determined. Glycine was identified as the nitrogenous precursor of porphyrin. Applications in the specific labeling of mammalian red cells are discussed. (C.H.)

8518 TID-7554(p.375-7)
Brookhaven National Lab., Upton, N. Y.
PRE- AND POSTEXPOSURE PROTECTION FROM THE EFFECTS OF IONIZING RADIATION. E. P. Cronkite. p.375-7 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 3p.

A great world-wide effort has gone into attempts to modify favorably the effects of radiation both before and after exposure. These efforts are motivated by the hope that knowledge about factors which modify the response will lead to increased understanding of the interaction of radiation and living things, and the very human desire to develop specific useful pre-exposure prophylaxis and specific postexposure therapy for radiation effects when exposure of man becomes inevitable or has occurred accidentally. A working model of the effects of radiation on mammalian systems is outlined with respect to the disturbance caused by radiation in proliferative tissues essential to life. The status of present-day knowledge within this framework with respect to both pre- and postexposure protection is reviewed and illustrated. Lastly, the applicability of this store of information to the prophylaxis and treatment of radiation injury of man is analyzed, an outline of therapy presented, and current trends in research discussed. (auth)

8519 TID-7554(p.378-9)
Harvard Univ., Boston. Medical School.
FUNCTIONAL AND PATHOLOGICAL ALTERATIONS FOLLOWING EXPOSURE TO IONIZING RADIATION. S. Warren. p.378-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 2p.

Factors influencing the pathological effects of radiation are reviewed. (C.H.)

8520 TID-7554(p.380-6)
Brookhaven National Lab., Upton, N. Y.
THEORY OF TRACER TECHNIQUES. J. S. Robertson. p.380-6 of PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

Applications of radioactive tracers in biological and medical studies are discussed. The usefulness of radioactive tracers in studies of steady-state situations without disturbing the steady state is stressed. Applications of electrical analog computers in studies of complicated steady-state reactions are described. (C.H.)

8521 TID-7554(p.387-90)
Harvard Univ., Boston. Medical School.
USE OF RADIOIODINE IN CARCINOMA OF THE THYROID. E. M. Chapman. p.387-90 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 4p.

A review of results from over 500 patients with inoperable carcinoma of the thyroid led to the conclusion that there are almost no cures of metastatic cancer of the thyroid, but treatment with radioiodine can make the patient more comfortable and prolong life. (C.H.)

8522 TID-7554(p.391-404)
Columbia Univ., New York. Coll. of Physicians and Surgeons and Presbyterian Hospital, New York.
TEN-YEAR RESULTS OF I^{131} THERAPY OF HYPERTHYROIDISM. S. C. Werner, B. Coelho, Edith H.

Quimby, and R. M. Day. p.391-404 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 14p.

Clinical results are summarized from a series of 525 hyperthyroid patients treated with iodine-131. The results confirm that iodine-131 is a highly efficacious agent for the medical treatment of hyperthyroidism, but indicate that some features of this method of treatment still remain a source of trouble. (C.H.)

8523 TID-7554(p.405-9)
California. Univ., Los Angeles. School of Medicine.
DIAGNOSTIC USE OF ISOTOPES IN HEMATOLOGICAL PROBLEMS. J. F. Ross. p.405-9 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 5p.

Practical applications of isotope techniques in studies of patients with hematologic disease are reviewed. The techniques described are inexpensive and have been found to be very helpful clinically. (C.H.)

8524 TID-7554(p.410-12)
California. Univ., Berkeley. Donner Lab.
REGULATION OF RED-CELL PRODUCTION. J. H. Lawrence. p.410-12 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 3p.

Applications of tracer techniques in studies of red-cell production are described. Iron-59, phosphorus-32, and carbon-14 were found useful tools in these studies. Results are described from studies at high altitudes in the Andes, at sea level, and in a low-pressure chamber with both animals and man, and studies in normal and nephrectomized or hypophysectiomized parabiotic rats. (C.H.)

8525 TID-7554(p.413-17)
Halifax District Hospital, Daytona Beach, Fla.
TELETHERAPY. H. D. Kerman. p.413-17 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 5p.

The advantages of supervoltage therapy are weighed against certain disadvantages. The equipment is more costly than conventional x-ray equipment, there is no dramatic increase in cure rate, serious damage to vasculo-connective tissue below the skin is possible, and more precise dosimetry is needed. The use of supervoltage is certainly not without its special dangers. Serious damage to the vasculo-connective tissue beneath the skin and to the gastrointestinal tract has occurred when tolerance levels for these areas were not constantly taken into consideration. Constant and meticulous attention to positioning and dosimetry becomes increasingly important. (auth)

8526 TID-7554(p.418-29)
Oak Ridge National Lab., Tenn.
TELETHERAPY. Marshall Brucer. p.418-29 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 12p.

A brief summary is presented of developments in the medical use of radiation. The history of developments in the field of teletherapy is reviewed. Applications of cobalt-60 and cesium-137 in teletherapy machines for cancer therapy are described and illustrated photographically. (C.H.)

8527 TID-7554(p.430-2)
Argonne Cancer Research Hospital, Chicago.
BRACHYTHERAPY. P. V. Harper. p.430-2 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 3p.

Brachytherapy refers to close range therapy and includes interstitial therapy in which radioactive sources are implanted within the region of tissue to be treated. Applications of a number of isotopes as radiation sources for interstitial therapy of tumors are reviewed. These include the following: the use of radioactive tantalum wire; radioactive sources of cobalt, gold, or iridium enclosed in plastic tape which can be threaded through a tumor to produce an implant; exactly-machined implants of radioactive gold shielded with platinum; surgical implantation of polyethylene tubing in a tumor for subsequent filling with radioisotopes; applicators made of a piece of blotting paper sealed in a polyethylene envelope to be saturated with a solution of the desired isotope; isotopes which decay by electron capture such as cesium-131 and palladium-103 for use as implants; and radioactive materials in the form of colloidal suspensions such as gold, yttrium, and phosphorus-32 as chromic phosphate. The use of small beta sources for the production of local cauterizing radiation is discussed. Applications for producing exactly controlled lesions in the central nervous system, in producing local cardiac infarction, in the destruction of the globus pallidus in cases of Parkinsonism, and in the destruction of the hypophysis for treatment of metastatic carcinoma of the breast are discussed. (C.H.)

8528 TID-7554(p.433-47)
Oak Ridge Inst. of Nuclear Studies, Inc., Tenn.
CLINICAL USES OF RADIOACTIVE COLLOIDS. G. A. Andrews. p.433-47 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 15p.

Radioactive colloids are useful in therapy because under some circumstances they provide selective radiation to localized areas. This localization is achieved partly by means of the purely mechanical factor of the site of injection but also partly by the reaction of the body to the colloid. Methods of administration are described. The influence of methods of administration on dosage, tissue distribution, and radiation effects are discussed. It is concluded that radioactive colloids will never play a large role in diagnosis or therapy, but for selected situations they have unique advantages. (C.H.)

8529 TID-7554(p.448-53)
Brookhaven National Lab., Upton, N. Y.
THE NUCLEAR REACTOR AS AN INSTRUMENT IN MEDICAL THERAPY. L. E. Farr. p.448-53 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 6p.

Experiences are summarized in the use of a nuclear reactor as an instrument in medical therapy. Patients with a diagnosis of glioblastoma multiforme were given

large intravenous doses of boron-10 as borax or sodium pentaborate before exposure to thermal neutron radiation. Results led to the conclusion that there is merit in this approach to control of neoplastic disease of the central nervous system. Temporary amelioration of symptomatology was noted, associated in some instances with measurable determinations of a temporary cessation in tumor expansion. Applications of a nuclear reactor in the production of short-life isotopes for medical use and in activation analysis are also discussed. (C.H.)

8530 TID-7554(p.455-6)
Uruguay. Universidad de la República, Montevideo.
EXPERIMENTAL IONTOPHORESIS WITH RADIOPHOSPHORUS. V. H. Gonzalez-Panizza, U. Gelos, and M. A. Patetta-Queirolo. p.455-6 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 2p.

The distribution of phosphorus-32 in the various tissues of the hind limb of the toad, Bufo arenarum, was studied following introduction of PO_4 ions by iontophoresis using a longitudinal electrical field of fixed intensity and duration. Curves of the concentration of phosphorus-32 expressed as a function of the distance to the negative pole were made for bone, muscle, and skin. The concentrations in the blood and in distant tissues were also determined as an index of the focal dispersion. From results of the studies it was concluded that gradient differs in different tissues. Muscular conduction appeared to be the fundamental cause of the passage of ions to the blood. (C.H.)

8531 TID-7554(p.457-63)
Chile. Universidad, Santiago.
USE OF ISOTOPES IN HEMATOLOGIC RESEARCH. G. S. Hodgson, J. Toha, I. Eskuche, D. Yudilevich, and P. Hernandez. p.457-63 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 7p.

Results are summarized from studies using iron-59 in determinations of the influence of humoral factors on erythropoiesis, total blood volume measurements, and plasma iron turnover. (C.H.)

8532 TID-7554(p.464-8)
Fundación Luís Roche. Instituto de Investigaciones Médicas, Caracas.
STUDIES WITH RADIOACTIVE CHROMIUM (Cr^{51}) AND RADIOACTIVE IRON (Fe^{59}) ON PATIENTS WITH HOOKWORM INFECTION. M. Roche and M. E. Perez-Gimenez. p.464-8 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 5p.

The pathogenesis of the anemia associated with hookworm infection was investigated with the aid of chromium-51 and iron-59. Results are reported from studies on the excretion of chromium-51 from circulating erythrocytes, the reabsorption of chromium from the intestinal tract, the relation between blood hemoglobin level and blood loss, and iron metabolism and fecal iron loss in hookworm-infected patients. (C.H.)

8533 TID-7554(p.469-72)
Santa Isabel Clinic, La Paz, Bolivia.
APPLICATIONS OF RADIOIODINE IN MEDICINE. L. F. Hartmann. p.469-72 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 4p.

Applications of the various radioisotopes of iodine in investigations of thyroid function are reviewed. Results are summarized from a series of patients with diffuse hyperthyroidism, nodular hyperthyroidism, or hypothyroidism in which iodine-131 was used in diagnosis or therapy. (C.H.)

8534 TID-7554(p.475-86)
Brookhaven National Lab., Upton, N. Y.
USE OF ISOTOPES IN PLANT BIOCHEMISTRY. R. C. Fuller. p.475-86 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 12p.

Applications of carbon-14 in studies of plant biochemistry are reviewed. The uses of oxygen-18, sulfur-35, and tritium in studies on photosynthesis and plant metabolism are discussed. (C.H.)

8535 TID-7554(p.487-503)
California. Univ., Berkeley. Kearney Foundation of Soil Science.
USE OF RADIOISOTOPES IN PLANT NUTRITION STUDIES. P. R. Stout and T. C. Broyer. p.487-503 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 17p.

Applications of radioisotopes in research on plant nutrition are reviewed. Related subjects such as soil chemistry, entomology, plant pathology, genetics, and plant physiology are also discussed. (C.H.)

8536 TID-7554(p.504-26)
Iowa State Coll., Ames.
USE OF RADIOISOTOPES IN SOIL AND FERTILIZER RESEARCH. C. A. Black. p.504-26 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 23p.

Available as Iowa State Coll. Agr. Exp. Sta. Bull. No. J-3207.

Applications of radioisotopes in research on soils and fertilizers are reviewed. Tracer studies are described in which radiation was used to detect the presence of the isotope and in which the interaction of the radiation with the soil was used to measure some property of the soil. Principles and applications of both types of studies are reviewed. (C.H.)

8537 TID-7554(p.527-35)
Department of Agriculture. Beltsville, Md.
STUDIES OF INSECTS AND INSECTICIDES WITH RADIOACTIVE MATERIALS. A. W. Lindquist. p.527-35 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 9p.

Entomology is among the scientific disciplines employing radioactive materials in studies on the biology, physiology, toxicology, biosynthesis, disease transmission, and effects of radiation on reproduction, habits, longevity, and control of insects. Flight habits, dispersal distances, migrations, longevity, and population numbers have been studied with specimens tagged with radioactive materials. Results are reviewed from studies on the effects of radiation on insects and

studies with radioactive insecticides. Applications in the control of insect pests are discussed. (C.H.)

8538 TID-7554(p.536-54)
Illinois. Univ., Urbana.
USE OF RADIOISOTOPES IN RESEARCH IN ANIMAL METABOLISM. B. C. Johnson. p.536-54 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 19p.

A review is presented of studies on animal metabolism in which radioactive tracers were used. Emphasis is on biochemical research employing carbon-14, sulfur-35, and calcium-45 in studies in the field of intermediary metabolism, distribution studies, metabolic pathway studies, and rate studies. (C.H.)

8539 TID-7554(p.555-68)
Massachusetts Inst. of Tech., Cambridge.
RADIATION IN FOOD AND DRUG STERILIZATION AND PRESERVATION. S. A. Goldblith and B. E. Proctor. p.555-68 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 14p.

Recent developments in the application of ionizing energy to food and pharmaceutical sterilization are reviewed. (C.H.)

8540 TID-7554(p.569-76)
Johns Hopkins Univ., Baltimore.
INDUCTION OF MUTATIONS WITH RADIATION. H. B. Glass. p.569-76 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 8p.

Data are summarized from a number of studies on the induction of mutations by radiation. It is pointed out that the loss of a part of the genetic material is irreparable and a large portion of all the hereditary changes induced by radiation consists of such losses. Estimates are included of the dose of background radiation and the average gonadal exposure of the U. S. population due to medical and dental uses of x-rays, radium, and radioactive isotopes. The contribution to the exposure of the general population due to weapons testing fall-out and also to peaceful uses of atomic energy is estimated. From these rough estimates it is concluded that the level of exposure for the general population may well be approaching 50 per cent of the total recommended permissible dose. The need for adequate personal exposure records is stressed. (C.H.)

8541 TID-7554(p.577-86)
Ecuador. Escuela Politecnica Nacional, Quito.
EXPERIMENTS ON BIOSYNTHESIS OF RADIOACTIVE PYRETHRINS. L. W. Levy and A. Usubillaga. p.577-86 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 10p.

Pyrethrins are obtained from pyrethrum flowers (Chrysanthemum cinerariaefolium). Although the plants will grow in any part of the world, it has been observed that the flowers contain an appreciable amount of pyrethrins only when cultivated at high altitudes with temperate climates. Pyrethrins are substances of strong insecticidal actions but are completely nontoxic to warm-blooded animals and to man. The use of pyrethrins as insecticides is growing since insects develop no resistance to pyrethrins as they do to synthetic insecticides. The preparation of radioactive pyrethrum extract is reported following exposure of plants to an atmosphere containing carbon dioxide labeled with carbon-14. (C.H.)

8542 UR-530
Rochester, N. Y. Univ. Atomic Energy Project.
STUDIES ON AEROSOLS. Lucien Dautrebande. July 25, 1958. 587p. Contract W-7401-eng-49. $7.00 (OTS).

A monograph summarizing published and unpublished experimental and technical data on liquid and solid aerosols (inert, pharmacological, or toxic) is presented. Emphasis is given to the production, measurement, and biological importance of submicronic and submicroscopic particles, and to the physiological and pathological effects caused by their retention in the respiratory tract. The bibliography consists of more than three thousand references. (auth)

8543 UR-537
Rochester, N. Y. Univ. Atomic Energy Project.
SOME ATTEMPTS TO MODIFY THE EARLY HEALING PROCESS OF MODERATE SECOND DEGREE BURNS. Bernard Lerman and J. Raymond Hinshaw. Dec. 4, 1958. 14p. Contract W-7401-eng-49. $3.30(ph), $2.40 (mf) OTS.

By the injection of hormones and other agents which have been reported to influence scar formation, attempts were made to interfere with normal wound healing after the production of moderate second degree burns in pigs. It was hoped that some information on the development or prevention of hypertrophic scars and keloids might be gained from this experiment. Systemic administration of Doca, cortisone, and toluidine blue, and local injection of cortisone, histamine, and hyaluronidase neither delayed healing nor altered significantly the histologic processes involved in the restoration of dermal tissues. (auth)

8544 USNRDL-TR-290
Naval Radiological Defense Lab., San Francisco.
LATE EFFECTS OF FAST NEUTRONS VERSUS X-RAYS IN MICE: NEPHROSCLEROSIS, TUMORS, LONGEVITY. P. C. Nowell and L. J. Cole. Jan. 2, 1959. 26p.

Groups of mice exposed to sublethal doses of fast neutrons or to lethal doses of x-rays were followed until natural death in order to study long-term irradiation effects. The x-irradiated mice were protected against acute death by injection of hematopoietic cells or limb shielding. Gastrointestinal carcinomas were much more common in the neutron-irradiated than in the x-irradiated mice. However, in the small group of mice surviving superalethal doses of x rays of 1000 to 1100 r following thigh shielding during exposure, 21% exhibited intestinal carcinomas. A neutron RBE value of 2 to 3 is therefore indicated for these tumors, as late effects. Nephrosclerosis, on the other hand, was more common in the x-irradiated mice, with an apparent neutron RBE value close to unity for this late lesion. (auth)

8545 AEC-tr-3494
ISOTOPES IN MICROBIOLOGY: TRANSACTIONS OF THE CONFERENCE ON THE APPLICATION OF TRACER ATOMS IN MICROBIOLOGY. (Izotopy v Mikrobiologii: Trudy Knoferentsii po Primeneniyu Mechneykh Atomov v Mikrobiologii.) A. A. Imshenetzkii, ed. Translated from a publication of the publishing house of the Academy of Sciences, U.S.S.R., Moscow, 1955. 261p. $4.00(OTS).

Nineteen papers are included which place emphasis upon applications of isotopes as tracers in studies of metabolism in microörganisms. Techniques and experimental peculiarities of tracer techniques are discussed. The mechanism and kinetics of isotope exchange are reviewed. Topics discussed include: applications of radioisotopes in investigations of the viruses responsible for diseases of plants, animals, and humans; the penetration of phosphorus-32 into cells of microörganisms and subsequent transfer to the host plant; a procedure for developing labeled Brucellae and their use in the study of the pathogenesis of Brucellian infection; the role of iron in the metabolism of obligate anaerobes of the genus Clostridium; the study of phosphorus exchange and the liberation of phosphorus-32 and carbon-14 from the substances of yeast cells during the fermentation process; the influence of vitamins upon the biosynthetic processes of microörganisms; a study of the exchange of phosphorus-32 in the chemosynthesis of sulfate-reducing bacteria; the influence of carbon dioxide upon the development of heterotrophic microörganisms in relation to conditions in the medium; the use of carbon-14 in the study of the formation of organic matter from mineral components in aquatic environments and the comparative values of photo- and chemosynthesis in lakes of various types; the role of microörganisms in the nutrition of trees; the use of tracers in the study of the mycotrophy of trees; the consumption of organic matter synthesized by microörganisms in the roots of plants; and the part played by microörganisms of the rhizospheres in vitamin and amino acid nourishment of plants. 301 references. (C.H.)

8546 AEC-tr-3550

PATHOLOGICAL ANATOMY OF LATE PHASES OF RADIATION SICKNESS IN ANIMALS POISONED WITH PRODUCTS OF URANIUM DIVISION. A. A. Pinus. Translated by A. L. Monks (Oak Ridge National Lab.) from Arkh. Patol. 19, 27-35(1957). 14p. (Figures not included) $3.30(ph), $2.40(mf) JCL or LC.

The pathological effects of uranium and its fission products were observed in 32 animals, including rats, rabbits, and dogs, following administration through the mouth, subcutaneously, through the respiratory organs, and intravenously. The life-span of the animals ranged from 110 days to one year and 8 months following the poisoning. Developments in the pathological process and histological observations are described. (C.H.)

8547 JPRS-518

THE HEALING OF FRACTURES DURING VARIOUS STAGES OF RADIATION DISEASE. Ya. G. Rubinshtoyn, N. B. Binjub, and L. I. Shishlyannikova. Translated from Voenno-Med. Zhur. No. 6, 33-7(1957). 7p. $0.50(OTS).

Results of studies on the effects of whole-body radiation exposure on the regeneration of bone fractures in dogs led to the conclusion that small dosages of x rays accelerate the growth of bone callus and stronger dosages suppress and retard its formation. Healing in puppies occurred three times as fast as in adult dogs. (C.H.)

8548 JPRS-764

APPLICATION OF ADRENALIN AND ACETYLCHOLINE IN COMBINATION FOR THE PROPHYLAXIS OF RADIATION DISEASE. L. F. Semenov and Ye. A. Prokudina. Translated from Med. Radiol. 2, No. 3, 35-40(1957). 9p. (PB-141497-T). $0.50(OTS).

The combination of adrenalin with acetylcholine was found to provide protection against radiation injury in mice when given immediately preceding irradiation. Possible reaction mechanisms are discussed. (C.H.)

8549 JPRS-766

EXPERIMENTATION OF BIOLOGICAL ANTI-RADIATION PROTECTION DURING EXPERIMENTAL X-RAY THERAPY OF TUMORS. M. P. Domshlak, I. I. Ivanov, O. I. Belusova (Belousova), and V. G. Yakovlev. Translated from Med. Radiol. 2, No. 3, 47-52(1957). 8p. $0.50(OTS)

Highly purified L-cysteine together with a 99% solution of sodium cyanide was found to be more effective than the compounds used separately in the prevention of radiation sickness during x-ray therapy. Observations were made on rats with sarcoma. (C.H.)

8550 NP-tr-211

THE DETERMINATION OF THYROID WEIGHT BY SCINTIGRAPHY AFTER ADMINISTRATION OF RADIOACTIVE IODINE. P. Doering and K. Kramer. Translated by S. Fitzgerald (U.K.A.E.A. Atomic Energy Research Establishment) from Strahlentherapie 105, 245-59(1958). 23p. $4.80(ph), $2.70(mf) JCL or LC.

A method is described for estimating the weight of the thyroid gland by scintigraphy following the administration of a tracer dose of iodine-131. The scintigraphic image must have sharply defined contours. (C.H.)

8551

EFFECT OF HIGH ENERGY PROTONS ON THE SPINAL CORD. Börje Larsson, Lars Leksell, Bror Rexed, and Patrick Sourander (Univ. of Uppsala). Acta Radiol. 51, 52-64(1959) Jan.

The spinal cord in the rabbit was irradiated with a 185-Mev proton beam from a 230 cm synchrocyclotron. Using a 1.5 mm broad beam, it was possible to effect sharply delimited lesions of the spinal cord with only minimal hemorrhages and without any general reactions. With a 10 mm beam the tissue reactions are much more severe. The histopathology of the acute radiation necrosis is described and the factors responsible for its appearance are discussed, especially the width of the proton beam and the size of the single radiation dose. (auth)

8552

DEPTH DOSE DISTRIBUTION USING POINT SOURCES OF Cs^{137} FOR PLESIOTHERAPY. Johan Baarli (Norwegian Radium Hospital, Oslo). Acta Radiol. 51, 65-73(1959) Jan.

Calculations of depth-dose distributions from point sources of Cs^{137} (662 kev) were carried out for SSD of 5 and 10 cm and opening angles of 60 and 36°, respectively. The dose distribution was obtained by calculating the dose decrease with depths, caused by the primary radiation, and adding to this the contribution from the scattered radiation. The latter was evaluated from the integral calculated for the once scattered radiation where an approximation was introduced in order to include the multiply scattered radiation. The estimated depth-dose distribution was compared with experiments using a 5 curie Cs^{137} source. (auth)

8553

THE LIVER, RADIATION AND LEUKEMIA. Marion F. Beard (Univ. of Louisville, Ky.). Am. J. Roentgenol. Radium Therapy Nuclear Med. 81, 504-8(1959) Mar.

It is postulated that the following relationship exists between irradiation and leukemia: chronic radiation ef-

fects on the liver result in the production of an alpha globulin which has a peculiar affinity for B_{12}. This protein gradually binds excessive amounts of vitamin B_{12} from the liver, or from an intestinal tract containing normal amounts of the vitamin. This excessive bound B_{12} is biologically active, resulting in abnormal production of nucleoproteins and excessive formation of immature cells, leading to the clinical picture we call leukemia. The process may well be reversible at some stage of its development. (auth)

8554

GLASS DOSIMETRY FOR DETERMINATION OF DOSES TO A BIOLOGIC OBJECT IN A THIN WATER LAYER. PART II. Tor Brustad and Thormod Henriksen (Norwegian Radium Hospital, Oslo). Am. J. Roentgenol. Radium Therapy Nuclear Med. 81, 509-11(1959) Mar.

In order to study radiation effects on small organisms in water, an irradiation arrangement has been designed of a water layer confined between two coverslips by means of a steel spacer. The dose at the specimen position in the middle of the water layer is determined using glass dosimetry. The radiation induced colorization in the coverslips provides two separate means for measurements of the dose. (auth)

8555

RADIOLOGICAL ABNORMALITIES IN CHRONIC PULMONARY DISEASE DUE TO BERYLLIUM. John E. Gary and Richard Schatzki. Arch. Ind. Health 19, 117-25(1959) Feb.

The concept that there are stages of involvement of the lung by berylliosis which can be identified from films is questioned. Rather it is believed that the lung responds in one or another way to this irritant. Types of disease rather than stages of disease seems a concept more likely to depict the true state of affairs. There are frequently marked contrasts in the severity of disease as judged from the radiological appearance, the clinical condition of the patient, or by pulmonary function tests. The importance of serial films of persons known to have been exposed to beryllium is stressed if an early diagnosis is to be made. The question of treatment of persons who show radiological abnormalities in the absence of symptoms is raised. Cases with x-ray changes for over five years with no symptoms have been seen. The comments of other participants in this symposium are invited on this problem. Differential diagnosis is mentioned only briefly since it is believed that this is impossible from films alone. A definitive diagnosis demands the finding of significant amounts of beryllium in tissue showing characteristic pathological changes. No case has been seen which shows clinical evidence of berylliosis with a normal chest film. Complications of the disease are not discussed, since they are a guide to treatment but of no help in diagnosis. (auth)

8556

SUPERIOR CHELATING AGENTS FOR THE TREATMENT OF PLUTONIUM POISONING. J. F. Fried, E. H. Graul, J. Schubert, and W. M. Westfall (Argonne National Lab., Lemont, Ill.). Atompraxis 5, 1-5(1959) Jan.

A comparison is made of the relative effectiveness of chelating agents for the removal of plutonium from rats. As a standard of comparison, ethylenediaminetetraacetic acid (EDTA) was used to gage the value of two other chelating agents, diethylenetriaminepentaacetic acid (DTPA), and 2:2'-bis[di(carboxymethyl)amino]diethyl ether (BAETA). Six days after the intravenous injection of a mixture of Pu^{239} and Sr^{85} to rats, intermittent treatment with intraperitoneal injections of equimolar amounts of the three chelating agents was begun. The results show that DTPA and BAETA are several times more effective than EDTA in the removal of Pu, even when treatment is delayed. No effect on Sr^{85} removal was observed for any of the chelating agents, a fact which had been anticipated from their preferential binding for Ca relative to Sr. (auth)

8557

EXPERIMENTAL INVESTIGATIONS ON THE EFFECTS OF Co^{60} GAMMA RADIATION ON THE BRAIN AT VARIOUS DOSES AND SURVIVAL TIMES. Wilhelm Tönnis, Wilhelm Müller, Ortwin Wilcke, and Werner Maurer (Max-Planck-Institut für Hirnforschung; Neurochirurgischen Universitatsklinik; and Univ. of Cologne). Strahlentherapie 108, 23-33(1959) Jan. (In German)

Experiments were made on rabbits to determine damages of the parenchyma of the central nervous system by ionizing radiation. Co-60-beads of 10 to 12 mc were used as source of radiation. The animals were devided in 2 different groups. One group was irradiated for 48 hours, the other group for 90 hours. The animals were killed after different survival times. On the animals irradiated for 48 hours, significant changes were noted after 20 days. Applying 90 hours of irradiation ganglion cell damages were observed already during the first 6 day period. In this group already after 20 days secondary tissue damages were obvious which continued into necrosis. The correlation of the degenerative changes with the isodose lines shows good conformity with the results of other authors. The results of other investigators were discussed together with results. (auth)

8558

POTENTIATING ACTION OF THE CATALASE POISON AMINOTRIAZOLE ON HYDROGEN PEROXIDE TOXICITY. SIGNIFICANCE FOR THE BIOLOGICAL EFFECTS OF IONIZING RADIATION. Lyle V. Beck, Sarah Ch. Kalser, and Virginia R. Alexander (Univ. of Pittsburgh). Atompraxis 5, 11-13(1959) Jan.

In mice, aminotriazole induced marked decreases in both tissue (liver) catalase activity and the dose (LD_{50}) of hydrogen peroxide (H_2O_2) required to induce death. Both effects were counteracted by ethanol. These findings, coupled with a consideration of pertinent literature, indicate that: a) tissue catalase plays an important role in detoxication of hydrogen peroxide formed in metabolism, and b) hydrogen peroxide, if formed in tissues as a result of whole body x irradiation, does not play a significant role in x-ray-induced death. (auth)

8559

INCREASED RADIORESISTANCE OF BOMBYX MORI L. POLYPLOIDS AND THE GENERAL THEORY OF THE BIOLOGICAL ACTION OF IONIZING RADIATIONS. N. M. Tul'tseva and B. L. Astaurov (Severtsov Inst. of Animal Morphology). Biophysics (USSR) (English Translation) 3, 183-9(1958).

The radioresistance of silkworm embryos in the stages from diapause to middle spring development increases with the degree of polyploidy, other things being equal. There is a marked rise in resistance between diploid and triploid, and a lesser one between triploid and tetraploid. The data support the ideas as to the

essence of the biological effects of ionizing radiations. They show that the main causes of such effects as radiation damage to embryos of multicellular organisms are genotype changes in the cell nucleus. (auth)

8560

FORMS OF INACTIVATION OF YEAST CELLS BY IONIZING RADIATIONS. V. I. Korogodin (Lomonosov State Univ., Moscow). Biophysics (USSR) (English Translation) 3, 189-97(1958).

Yeast cells incubated at 30°C on solid media after γ-irradiation show three periods of delay in division which differ in the way they vary with dose, in reversibility, and in distribution within the irradiated population. Three types of inactivation are found: without prior division, after 1 and after 4 to 7 divisions. The distribution of these forms over the population depends on the dose. The late inactivation effect and recovery are not directly related to the ploidy and are found in haploid and diploid strains, at least if resting cells are γ-irradiated. It is supposed that the wave-like development of damage is a feature of the reaction to ionizing radiations shown by many unicellular organisms, as well as by multicellular ones. (auth)

8561

THE MECHANISM OF THE OXYGEN EFFECT IN RADIOBIOLOGY. L. Kh. Eidus, N. V. Kondakova, and G. K. Otarova (Inst. of Biophysics, Academy of Sciences of the USSR, Moscow). Biophysics (USSR) (English Translation) 3, 197-201(1958).

A mechanism by which some of the energy from ionizing radiations absorbed by living objects is conserved in long-lived excited electronic states in the macromolecules is proposed. In such a mechanism, oxygen acts by reacting with the irradiated system, as well as by participating in the radiolysis of water. The oxygen damage depends on the dose, being due to the latent damage stored in the object. The protein myosin was used for demonstration. The data indicate that oxygen reacts with excited myosin molecules and inactivates them. This mechanism is not clear. (J.R.D.)

8562

THE EFFECT OF WHOLE-BODY X-IRRADIATION ON ABSORPTION PROPERTIES OF THE LIVER. E. A. Ivanitskaia, A. M. Kuzin, Ia. V. Mamul', and A. L. Shabadash (Inst. of Biophysics, Academy of Sciences of the USSR, Moscow). Biophysics (USSR) (English Translation) 3, 201-7(1958).

Autoradiographs and histological preparations were made from rat liver perfused with colloidal silver-110 at different periods after whole-body irradiation with 1000 r x rays. The silver was phagocytized by Kupffer cells and adsorbed on vein walls and capillaries. The decrease in liver absorption capacity for colloidal silver is due to changes in the properties of high polymer compounds normally responsible for absorption. (J.R.D.)

8563

THE EFFECT OF X-IRRADIATION OF THE MATERNAL ORGANISM ON FOETAL HISTO-HAEMATIC BARRIERS (MEMBRANE PERMEABILITY). G. V. Nizhnik (Inst. of Biophysics, Academy of Sciences of the USSR, Moscow). Biophysics (USSR) (English Translation) 3, 207-13(1958).

The effects of various doses of x irradiation of the material organism on the development of foetal and newborn barrier functions were examined. Particular attention was devoted to the function of the blood-brain barrier in relation to irradiation of the placental barrier. Rabbits of the chinchilla strain were used. Phosphorus-32 as Na_2HPO_4 was used as an indicator of permeability. Foetal tissue activity after application of phosphate was found to be higher in all stages of development than maternal tissue. The phosphorus content of all foetal tissues decreased with age. On single whole-body irradiation of pregnant rabbits with 600 and 1000 r, foetal tissue activity was lower than control as measured 2 hours after phosphorus administration. Tissue activity decreases with irradiation intensity. (J.R.D.)

8564

STUDY OF THE RAPID TRANSMIGRATIONS OF SUBSTANCES IN AN ORGANISM USING γ-EMITTING ISOTOPES. N. A. Gabelova and G. M. Frank (Inst. of Biophysics, Academy of Sciences of the USSR, Moscow). Biophysics (USSR) (English Translation) 3, 214-24(1958).

The dynamics of redistribution of a substance in an organism was investigated by applying the principal of contrasting variations in radiation intensity. The technique of nonlinear gamma radiation registration was used. The equipment used consisted of several scintillation counters arranged to make up a multi-channel radiograph. The method of nonlinear registration has the advantage over conventional collimated counter equipment in that the nonlinear method is more sensitive to small changes in intensity of γ radiation. Several examples of application are given, and some other possible uses are pointed out. (J.R.D.)

8565

A METHOD FOR STUDYING THE EFFECT OF IONIZING RADIATION ON NERVE CELL FUNCTION. Y. A. Liberman (Inst. of Biophysics, Academy of Sciences of the USSR, Moscow). Biophysics (USSR) (English Translation) 3, 225-7(1958).

A technique is described for preparing liquid extracellular electrodes for use in the study of elaboration and translation of nerve signals in response to stimuli. The nerve processes in irradiated and unirradiated cells can be studied by use of the equipment. In addition, the technique can be applied to the study of tissue preparations and internal structure of nerve cells. (J.R.D.)

8566

THE TIME OF X-RAY INDUCTION OF CROSSOVERS AND OF TRANSLOCATIONS IN DROSOPHILA MELANOGASTER MALES. Lee E. Schacht (Univ. of North Carolina, Chapel Hill). Genetics 43, 665-78 (1958) Sept.

A comparison was made between the time of recovery of induced crossovers and time of recovery of induced translocations in the chromosomes of irradiated Drosophila. (C.H.)

8567

A COMPARISON OF THE RELATIVE EFFECTIVENESS OF RADIATIONS OF DIFFERENT AVERAGE LINEAR ENERGY TRANSFER ON THE INDUCTION OF DOMINANT AND RECESSIVE LETHALS IN DROSOPHILA. C. W. Edington and M. L. Randolph (Oak Ridge National Lab., Tenn.). Genetics 43, 715-27(1958) Sept.

An investigation was made of the effects of monochromatic 14-Mev fast neutrons and Co^{60} gamma rays on the induction of dominant lethals and of 14-Mev neutrons on the production of sex-linked recessive lethals in Drosophila. These results were compared with those of other reports from this laboratory, in

which radiations of different average LET were used. It was shown that the RBE of different radiations for the induction of both genetic effects studied is dependent on the LET of the radiation used. 34 references. (auth)

8568

COMPARISON OF EFFECTS OF X-RAYS AND THERMAL NEUTRONS ON DORMANT SEEDS OF BARLEY, MAIZE, MUSTARD, AND SAFFLOWER. B. H. Beard, F. A. Haskins, and C. O. Gardner (Univ. of Nebraska, Lincoln). Genetics 43, 728-36(1958) Sept.

Seeds of barley, maize, mustard, and safflower were treated with various doses of x rays and thermal neutrons, and observations of height, survival, and pollen abnormalities were made on the plants resulting from these seeds. In most cases a close relationship was found to exist between the three criteria of irradiation effect and dose of x rays or thermal neutrons. However, it is necessary that care be used in selecting the age of plant at which height and survival data are taken. The results suggest that although the chromosomes of the four species may differ widely in sensitivity to radiation damage, within each type of radiation the four species appear very similar with respect to influence on plant height per chromosomal abnormality. (auth)

8569

COMPARATIVE METABOLISM OF STRONTIUM AND CALCIUM IN MAN. Arthur R. Schulert and Edwin A. Peets (Columbia Univ., New York), and Daniel Laszlo, Herta Spencer, Martin Charles, and Joseph Samachson (Montefiore Hospital, Bronx, N. Y.). Intern. J. Appl. Radiation and Isotopes 4, 144-53(1959) Jan.

The metabolic fate of intravenously administered Sr^{85} and Ca^{45} was studied in man. It was found that the isotopes were somewhat equally divided between bone and soft tissue shortly after administration, but that after four months, more than 99 per cent of the fraction of each isotope remaining in the body resided in bone. The initial specific activity was far greater in soft tissue than bone with the values approaching uniformity in about four months. The retention among the bones in the interval studied was greatest in vertebrae and least in long bone shaft and skull. The bone exhibits no marked preference in the uptake of the isotopes initially. However, as Sr^{85} is preferentially excreted by the kidneys, the relative ratio of Ca^{45} to Sr^{85} remaining in bone gradually increases. The net retention of Ca^{45} is about 60 per cent whereas that for Sr^{85} is about 25 per cent. (auth)

8570

THE ROLE OF THE RETICULOENDOTHELIAL PHAGOCYTOSIS IN THE IRRADIATED MULTICELLULAR ORGANISM. I. EXAMINATION OF THE REMOTE ACTION OF RADIOTOXINS BY MEANS OF PARABIOTIC TECHNIQUES. Frederic Ludwig (Commissariat a l'Energie Atomique, Saclay, France). Intern. J. Appl. Radiation and Isotopes 4, 162-8(1959) Jan. (In French)

After one single irradiation the activity of the radiotoxins, as followed by an abscopal effect produced in an ascites tumor, is progressively reduced. Furthermore, by introduction of carbon particles in the bloodstream of parabiotically united rats, it is possible to achieve an abscopal effect in an ascites tumor of the non-irradiated partner, after previous irradiation of the other animal. Such injections of chemically inert granular systems in the blood stream of experimental animals reduce temporarily the granulopectic activity of the reticuloendothelial system and aggravate pathological conditions involving phagocytosis. We therefore conclude that appreciable fractions of the radiotoxins are neutralized by the reticuloendothelial system. (auth)

8571

RADIO-IODINE COUNTING IN UNANESTHETIZED MICE. David L. Joftes (New England Deaconess Hospital, Boston). Intern. J. Appl. Radiation and Isotopes 4, 227-31(1959) Jan.

A method is described for the immobilization of unanesthetized mice so that direct counts can be made of iodine-131 uptake by the thyroid. A special holding device is used in conjunction with a well collimated scintillation counter. (C.H.)

8572

AN APPARATUS FOR THE INTRACAVITY ADMINISTRATION OF RADIOACTIVE COLLOIDAL GOLD. D. G. Arnott and H. R. Knight (London Hospital). Intern. J. Appl. Radiation and Isotopes 4, 266-8(1959) Jan.

An apparatus is described for the intracavity administration of radioactive colloidal gold. With the equipment it is possible to dilute a sterile preparation of gold aseptically to any volume and run it into the patient by gravity feed. Observation and control of the process are maintained by indirect vision using a lamp-house and mirror. The equipment is fully shielded by lead. A schematic sketch is included. (C.H.)

8573

EFFECTS OF IONIZING RADIATIONS ON TISSUE MAST CELLS. R. Dutta-Choudhuri and H. Roy (Chittaranjan Cancer Hospital, Calcutta and National Medical Coll., Calcutta). Intern. J. Appl. Radiation and Isotopes 4, 268-9(1959) Jan.

Forty albino rats were treated with Fe^{59}, Au^{198}, or x rays, and effects on the morphology of peritoneal mast cells were studied. It is observed that the effects of ionizing radiation on tissue mast cells is to increase their population along with relative increase of abnormal types of cells. (auth)

8574

THE EFFECT OF TEMPERATURE ON POTASSIUM TRANSFER IN IRRADIATED YEAST. A. K. Bruce and J. N. Stannard (Univ. of Rochester, N. Y.). J. Cellular Comp. Physiol. 52, 165-75(1958) Aug.

The leakage and uptake of potassium in normal and x-irradiated yeast have been studied at temperatures from 1 to 36°C. Irradiation was carried out at 25° in all cases. Both processes are increased in rate by increasing temperature and follow the pattern expected of active metabolic processes. Radiation increases the rate of leakage but decreases the rate of uptake of potassium ion. The relationship of the radiation effect to temperature indicates an increased temperature coefficient for uptake, and a decreased temperature coefficient for leakage of potassium. This results in an apparently greater relative effect of radiation on both processes at the lower temperatures. It is possible that radiation accomplishes, in part, an uncoupling of the metabolic processes involved in active transport in the case of leakage, but makes the uptake process more dependent on energy expending reactions. The need for consideration of the conditions of measurement in assaying radiation effects is pointed up by these experiments. (auth)

8575

INFLUENCE OF IRRADIATION OF THE HOST ON THE BIOLOGICAL PROPERTIES OF STAPHYLOCOCCUS. G. A. Chekatilo. J. Microbiol. Epidemiol. Immunobiol. (USSR) (English Translation) 29, 745-8(1958).

The possibility of increasing the pathogenicity of Staphylococcus albus artificially introduced into irradiated guinea-pigs was investigated. The transition of the saprophytic Staph. albus to a more pathogenic form while vegetating in an irradiated animal was established. The variation of staphylococci in an irradiated animal is linked with the intermediate influence of irradiation on organisms by means of the interaction of the latter with the irradiated host. (J.R.D.)

8576

GRAFTED-MARROW-REJECTION MORTALITY CONTRASTED TO HOMOLOGOUS DISEASE IN IRRADIATED MICE RECEIVING HOMOLOGOUS BONE MARROW. J. J. Trentin (Baylor Univ. Coll. of Medicine and Univ. of Texas Dental Branch, Houston, Texas). J. Natl. Cancer Inst. 22, 219-28(1959) Feb.

Bone marrow from the BALB/c and CBA inbred strains of mice and the (BALB/c × CBA)F_1 hybrid strain was injected isologously and in various homologous combinations into CBA and (BALB/c × CBA)F_1 hybrid mice irradiated with 330 r, 550 r, or 770 r. At the sublethal dose of 330 r, no mortality resulted from any combination of marrow donor and recipient. At the higher doses, two types of mortality were observed in mice receiving bone marrow. Early mortality resulted 5 to 21 days after the ordinarily high sublethal dose of 550 r and delayed mortality resulted 21 to 60 days following good, early protection against the otherwise lethal dose of 770 r. Neither type of mortality occurred after administration of isologous marrow, but both types occurred after administration of marrow from an unrelated homologous strain. When F_1 marrow was transferred into the parental strain only early mortality was observed. When parental marrow was transferred into the F_1 hybrid only delayed mortality was observed. From these observations and other considerations it is concluded that the early mortality, resulting from administration of homologous or heterologous marrow into mice irradiated in the high sublethal or midlethal dose range, is the result of the recovered ability of the host to reject the temporarily grafted marrow, whereas the delayed mortality, following good, early protection against otherwise lethal doses of irradiation with homologous or heterologous marrow, usually results from an immunologic reaction of the grafted marrow derivatives against the tolerant host. The former type of mortality was designated grafted-marrow-rejection mortality; the latter, homologous disease or heterologous disease. (auth)

8577

INACTIVATION OF SPORES OF BACILLUS ANTHRACIS BY γ-RADIATION. T. Horne (Atomic Energy Research Establishment, Harwell, Berks, Eng.) and G. C. Turner and A. T. Willis (School of Medicine, Leeds, Eng.). Nature 183, 475-6(1959) Feb. 14.

Results obtained from an investigation into the sterilizing efficiency of γ radiation against spores of Bacillus anthracis are reported. The tests indicate that the most sensitive strain of B. anthracis failed to grow after 1.0×10^6 rad while the most resistant needed 1.5×10^6 rad for inactivation. (J.H.M.)

8578

RADIATION PROTECTION AND FREE RADICALS. Bernard Smaller and Eugene C. Avery (Argonne National Lab., Lemont, Ill.). Nature 183, 539-40 (1959) Feb. 21.

Data are presented which support the view that the radioprotective effect of β-mercaptoethylamine for yeast is not primarily due to inactivation of the products of irradiation of water, but rather to direct action of the protective agent on radiosensitive constituents such as cell protein. Paramagnetic resonance detection of free radicals was used to study the contribution of free radicals to radiation damage in living cells. (C.H.)

8579

LONG-TERM SURVIVAL OF IRRADIATED MICE TREATED WITH HOMOLOGOUS TISSUE SUSPENSIONS. Eric L. Simmons, Leon O. Jacobson, Edna K. Marks, and Evelyn O. Gaston (Univ. of Chicago). Nature 183, 556(1959) Feb. 21.

Data are presented on the long-term survival of irradiated mice treated with homologous tissue suspension. (C.H.)

8580

ELECTRON-BEAM STERILIZATION OF SURGICAL SUTURES. Charles Artandi and Walton Van Winkle, Jr. (Ethicon, Inc., Somerville, N. J.). Nucleonics 17, No. 3, 86-90(1959) Mar.

The development and use of electron beam sterilization at Ethicon, Inc., Somerville, N. J., are described. A microwave linear accelerator is used. The advantages of this machine over a gamma source or an x-ray device are pointed out. Substituting radiation for heat results in a stronger product, a better package, simpler manufacture, and continuous processing. These advantages help pay for the greater expense involved. The facility, machine, process, package design, cost, and safety are discussed. (T.R.H.)

8581

THE INFLUENCE OF TEMPERATURE AND WATER CONTENT ON THE X-RAY SENSITIVITY OF BARLEY SEEDS. W. S. B. Lowry (Hume Street Hospital, Dublin). Phys. in Med. Biol. 3, 291-3(1959) Jan.

Data are presented which indicate that when the water content of dry barley seeds is slightly increased, the radiosensitivity decreases at first, but is followed by a marked increase. The radiosensitivity of dry seeds was found to be almost independent of temperature. Possible reaction mechanisms involved are discussed. (C.H.)

8582

DEPENDENCE OF MUTATION FREQUENCY ON RADIATION DOSE RATE IN FEMALE MICE. W. L. Russell, Laine Brauch Russell, and Mary B. Cupp (Oak Ridge National Lab., Tenn.). Proc. Natl. Acad. Sci. U. S. 45, 18-23(1959) Jan.

The specific locus mutation rate in females is significantly higher following acute than following chronic irradiation. Since conditions in the adult mouse ovary are such that complications from secondary factors are unlikely, it can be concluded that in oöcytes there is a dose-rate effect on the mutation process itself. The influence of dose rate on the frequency of mutations following irradiation of spermatogonia, which was demonstrated earlier and which could have been due to secondary factors, is now, in the light of the oöcyte results, also considered to be due to a dose-rate effect on the mutation process. The most significant features of the results, from the point of view of human hazards, are, first, that there is, at present, no evidence that females are less sensitive than males and, second, that the finding of a dependence of mutation frequency on radiation dose rate, now extended from males to females,

applies to those germ cell stages that are important in human hazards. (auth)

8583

INFLUENCE OF STABLE Sr ON PLANT UPTAKE OF Sr 90 FROM SOILS. E. M. Romney, G. V. Alexander, G. M. le Roy, and K. H. Larson (Univ. of California, Los Angeles). Soil Sci. 87, 42-5(1959) Jan.

Varied treatments of $Sr(NO_3)_2$ and $SrSO_4$ were applied to three different types of Sr 90-contaminated soil to determine to what extent stable Sr might reduce plant uptake of radiostrontium by the effect of carrier dilution. Applications of stable Sr at levels ranging from 0.1 to 5.0 me. Sr per 100 g. of air-dry soil increased the uptake of Sr 90 by beans and Ladino clover. Stable Sr displaced Sr 90 adsorbed on the soil exchange complex into the soil solution where it was more readily available to the plant. This effect was most apparent in an acidic soil containing a very low level of native Sr. Stable Sr uptake was linear with respect to the level of exchangeable Sr in the soil; however, the total amount of Sr accumulated by the plant was dependent upon the available soil calcium. Plants obtained more stable Sr from $Sr(NO_3)_2$-treated soils than from $SrSO_4$-treated soils. The levels of stable Sr required to effectively reduce plant uptake of Sr 90 from soils by carrier dilution were greater than 5.0 me. Sr per 100 g. of soil, that is, equivalent to more than about 5 tons of Sr amendments an acre. (auth)

8584

EXPERIMENTAL INVESTIGATIONS ON THE DECONTAMINATION OF WATER WITH RESPECT TO THE PREPARATION OF DRINKING WATER FROM RADIOACTIVE POISONED SURFACE WATERS. II. E. H. Graul and E. K. Reinhardt (Philipps-Universität, Marburg/Lahn and SEITZ-Werke GmbH., Bad Krenuznach, Ger.). Atompraxis 5, 5-10(1959) Jan. (In German)

Fundamentals and operation method of a continuous 4-stage process for preparing drinking water from radiologically, biologically, and chemically contaminated water are described, together with experiments on radioactive decontamination with model plants on a laboratory scale. About 250 μc of Sr^{90}-Y^{90}/l and 100 μc of P^{32}/l, as well as 1 μc/l of mixed fission products, were used as contamination material. In the case of mixed fission products, the decontamination factors obtained for the especially important radionuclides Sr^{90}, Sr^{89}, and Cs^{137} lie between 22,000 and 7,200; the corresponding individual residual activities lie 2 powers of 10 and more below the maximum permissible concentration when supply is permanent (MPC_p). A portable filter unit composed of several parts with a motor pump and an output of 400 l of water/h, working on the same principle, is also presented. In conclusion, a 2-part portable filter unit under development is mentioned; it is mounted on a trailer with 1 or 2 axles and has an output of up to 4000 l/h. (auth)

8585

THE EFFECT OF FEMALE HORMONES ON GENERAL AND LOCAL RADIATION SENSITIVITY. Richard Kepp and Dieter Hofmann (Universitäts-Frauenklinik, Giessen, Ger.). Strahlentherapie 108, 34-42(1959) Jan. (In German)

In a large number of experiments about biological radiation protection, the effect of hormones, particularly of sex hormones, was tested for their influence on the sensitivity to radiation of animals. About the effect of sex hormones on the sensitivity to radiation only confusing and contradictory results were reported up to now. It was observed that patients after ovarectomy are less sensitive to radiation. Based on this observation, animal experiments were made to determine the lethal dose 50, i.e., general reaction, and the appearance of skin erythemas, i.e., the local reaction. An active radiation protection concerning the general reaction can be observed in rats. It does not depend on the length of the interval between ovarectomy and the beginning of the irradiation. For the local reaction a radiation protection can only be observed if the interval between ovarectomy and irradiation was more than 10 to 12 weeks. Irradiation at shorter intervals causes an increased local reaction. (auth)

8586

INVESTIGATIONS ON A BIOLOGICAL RADIATION PROTECTION. XXIX. THE EFFECT MECHANISM OF RESERPIN IN RADIATION PROTECTION RESEARCH. Hanns Langendorff, Hans-Joachim Melching, and Hans-Adolf Ladner (Univ. of Freiburg i. B.). Strahlentherapie 108, 57-62(1959) Jan. (In German)

In a series of studies concerning the mode of action of reserpine for radiation protection the effectiveness of different Rauwolfia alkaloids was reported. A combined experiment with reserpine and cysteamine supports the idea that the mode of action for radiation protection of both substances is possibly of a different nature. A reduction of the effect of radiation protection of reserpine was noted if iproniazid was given at the same time. This suggests that monaminoxydase and 5-hydroxytryptamine plays an important part in the effectiveness of reserpine for radiation protection. (auth)

8587

INVESTIGATIONS ON THE THERAPEUTIC POSSIBILITIES IN POISONING WITH RADIOACTIVE FISSION PRODUCTS. 5. THE EFFECT OF CHELATE FORMATION ON THE BIOLOGICAL BEHAVIOR OF RADIOSTRONTIUM. Alexander Catsch and Helga Melchinger (Heiligenberg-Instituts, Heiligenberg/Baden, Ger.). Strahlentherapie 108, 63-72(1959) Jan. (In German)

The effect of several chemical compounds on the distribution of carrierfree radiostrontium in the rat was studied. Its deposition in the skeleton can be reduced by 15 to 40% by early administration of diaminodiethylethertetraacetic acid, diaminodiethylsulfidtetraacetic acid, sodium citrate, pyrocatechindisulfonic acid, poly- and meta-phosphate, and zirconium citrate. Delayed onset of therapy has no effect even if parathyroid hormone is administered simultaneously. (auth)

8588

THE QUESTION OF THE PROTECTION MECHANISM OF SULFHYDRYL (_SH) SUBSTANCES. Hans-Joachim Maurer and Adam Schreiber (Universität und des Inselspitals, Bern). Strahlentherapie 108, 73-83(1959) Jan. (In German)

Data are summarized from a literature survey on the biological behavior of sulfhydril substances and the effects of sulfhydryl substances in radiation protection. Results are reported from studies on the protective effect of cysteamine against radiation injuries in Vicia faba. The radioprotective effects of cysteamine appeared to be due to a decrease of the total metabolism. The effects of cysteamine and nitrogen were compared. (C.H.)

8589
THE QUESTION "RECOVERY SPEED OR RESISTANCE INCREASE" OF THE X-IRRADIATED SKIN OF FROGS (RANA ESCULENTA) IN SMALL FRACTIONATION. Carlos Amoroso and Werner Lorenz (Johannes Gutenberg-Universitat, Mainz). Strahlentherapie 108, 84-92(1959) Jan. (In German)

Sixty-one frogs (Rana esculenta) were irradiated in urethan anesthesia. The right upper leg was irradiated with a surface dose of 12,000 r. The left upper legs of the same animals were irradiated subsequently with a surface dose of 2 times 6000 r, respectively 3 times 4000 r at intervals of 1, 3, 6, 24, or 72 hours. The single irradiation of 12,000 r caused changes of the pigmentation and formation of ulcers after 3 weeks. After 8 weeks 35 out of 61 animals had formation of ulcers. The first tendency for healing was observed after 10 weeks. By the use of divided doses of 3 times 4000 r or 2 times 6000 r, with intervals as short as one hour, the effect of the irradiation caused less damage, probably due to increased resistence, which may have developed during the intervals between irradiations. (auth)

8590
THE BEHAVIOR OF ADENOSINTRIPHOSPHATASE IN THE SPLEEN AND LIVER OF WHOLE BODY IRRADIATED MICE. Heinz Breuer and Heinz Karl Parchwitz (Universitätsklinik und Poliklinik, Bonn). Strahlentherapie 108, 93-6(1959) Jan. (In German)

The activity of adenosinetriphosphatase (ATPase) in the spleen and liver was determined in white mice after whole-body irradiation. The doses of whole-body irradiation were 200 r, 600 r, 2000 r, 8000 r, 40,000 r, and 50,000 r. After 1 to 2 hours no change in the activity of ATPase was observed. 24 and 48 hours after irradiation the enzyme activity in the spleen was significantly increased, but no significant changes were observed in the liver. The increase of ATPase-activity in the spleen after irradiation was practically independent of the dose. The results demonstrate that there is no direct effect of radiation on ATPase. (auth)

8591
INVESTIGATIONS OF THE BEHAVIOR OF RADIOHOLMIUM (Ho^{166}) IN ORGANS OF THE WHITE MOUSE. Ernst Spode, Friedrich Gensicke, and Roland Glaser (Deutschen Akademie der Wissenschaften, Berlin-Buch). Strahlentherapie 108, 97-101(1959) Jan. (In German)

The authors report on the distribution of Ho^{166} in the organs of the mouse after subcutaneous and intraperitoneal injection. The special importance of the applied weight dose is pointed out. It seems that in the tested form radioholmium is fit for use in interstitial tumor therapy. (auth)

8592
THE INDUCTION OF ANEMIA AFTER SINGLE SHORT-TIME WHOLE-BODY IRRADIATION WITH X RAYS IN THE RABBIT. Walter Sauerbier (Max-Planck-Institut für Biophysik, Frankfurt am Main). Strahlentherapie 108, 102-6(1959) Jan. (In German)

The author has examined the degradation of autogenic erythrocytes in rabbits submitted to total irradiation. As a rule, there is no increased degradation of the peripheral red blood-cells after 550 r total x raying, nor is there any direct effect on the peripheral erythrocytes, if the named dose is applied. The anemia observed after 550 r total irradiation is mostly due to a hypoplasia or aplasia of the bone marrow. (auth)

8593
X-RAY INVESTIGATIONS IN PREGNANCY AND CHILD LEUKEMIA. Károly Gefferth (Universitäts-Kinderklinik, Budapest). Strahlentherapie 108, 107-11(1959) Jan. (In German)

Over a period of 5 years the mothers of leukemic and other patients of the 1st Pediatric Hospital of the University of Budapest were studied as to what percentage had abdominal x-rays during their pregnancy. The mothers of leukemic children had been submitted to x-ray examinations more often than the mothers of other patients. However the result can not be considered evident enough that the intrauterine radiation damage was the cause of leukemia. Other reasons such as unexplained genetic, hormonal, and environmental infections factors are considered. (auth)

8594
THE GENETIC RADIATION DAMAGE OF THE PATIENT IN X-RAY THERAPY OF SKIN DISEASES. Carl Georg Schirren, Norbert Haumayr, and Ruth Dittmar (Univ. of Munich). Strahlentherapie 108, 127-44 (1959) Jan. (In German)

The exposure of the gonads in x-ray therapy of the skin was determined by almost 800 tests. The measurements were taken by means of condenser and argon chambers in connection with a condiometer. The following types of x-ray therapy of the skin were tested concerning their exposure of the gonads: inflammatory irradiation; long-distance x-ray therapy of the skin; x-ray therapy of skin tumors; x-ray epilation of the scalp; and irradiation of the sympathetic trunk. The average results were summarized by tables. They demonstrate the extent of the gonad exposure by the different types of x-ray therapy and point possibilities of prevention of gonad exposure by dangerous amounts of radiation. The extent of genetic danger for the patient is much greater than it was expected, despite of the use of modern soft ray technique. Of particular danger is x-ray therapy in regions close to the genital organs, particularly in the region of the anus and genital region. (auth)

8595
THE BIOLOGICAL DOSE OF COSMIC RADIATION DURING THE LARGE CHROMOSPHERIC ERUPTION OF FEBRUARY 23, 1956. Hermann J. Schaefer (U. S. Naval School of Aviation Medicine, Pensacola, Fla.). Strahlentherapie 108, 154-60(1959) Jan. (In German)

Reports are given about the increase of the intensity of cosmic radiation subsequent to the solar flare on February 23rd, 1956. Its consequences for radiation biology concerning the total ionization in the heavy nuclei in the lower part of the energy spectrum are discussed. (auth)

8596
ACHIEVEMENTS OF SOVIET ROENTGENOLOGY TO THE 40th ANNIVERSARY OF THE OCTOBER REVOLUTION. I. G. Lagunova. Vestnik Rentgenol. i Radiol. 32, No. 5, 3-9(1957). (In Russian)

A review is given of the development in roentgenology in the USSR. Statistical data are given on the number of laboratory units and doctors by states of the union. (R.V.J.)

8597
DEVELOPMENT OF ROENTGENOLOGY AND RADIOLOGY IN WHITE RUSSIA DURING THE YEARS OF SOVIET POWER. B. M. Sosina. Vestnik Rentgenol. i Radiol. 32, No. 5, 9-13(1957). (In Russian)

Statistical data are given on the development of roentgenology and radiology in White Russia. (R.V.J.)

8598

DEVELOPMENT OF DOSIMETRY IN THE USSR. M. Sh. Vainberg (State Scientific-Research Inst. of Roentgenology and Radiology). Vestnik Rentgenol. i Radiol. 32, No. 5, 35-40(1957). (In Russian)

A brief survey of the development of dosimetry in the USSR, submitted from the viewpoint of meeting the necessities of medical roentgenology, radiology, and hygiene is given. A list and brief characteristics of the more common native dosimetric apparatus, as well as the shortcomings of the modern state of dosimetry in the USSR and perspectives for its further development, are presented. (tr-auth)

8599

CYTOCHEMICAL LUMINESCENCE STUDY OF BLOOD AND BONE MARROW IN RADIATION SICKNESS. O. S. Sergel and A. A. Klimenko (State Scientific-Research Inst. of Roentgenology and Radiology). Vestnik Rentgenol. i Radiol. 32, No. 5, 76-81(1957). (In Russian)

Serial blood studies in 25 patients undergoing telegammatherapy were used to show the value of luminescent analysis for early diagnosis and prognosis of radiation sickness. The sensitivity of blood luminescence to small doses of radioactive isotopes was shown in studying 73 patients suffering from chronic radiation sickness. Tracer doses of I^{131} in thyroid cases and Na^{24} in animals modified blood luminiscence as early as 30 to 60 minutes after injection. These changes varied in accordance with the initial picture. The luminescent analysis was found to be highly sensitive and useful for spotting changes caused by ionizing radiation. (tr-auth)

8600

ON DISTANT SEQUEL AND REHABILITATION IN RADIATION SICKNESS. L. M. Omelyanenko (Central Medical Inst. for Graduate Work). Vestnik Rentgenol. i Radiol. 32, No. 5, 81-8(1957). (In Russian)

Reports on follow-up studies of 90 persons suffering from chronic radiation disease show that the pathological processes are reversible if the patients are removed from the source of ionizing radiation, and in some cases, when the conditions of work with radioactive substances are improved. During the recuperation period changes in the general condition and the blood picture tend to run a cycle course: periods of improvement are followed by periods of relative deterioration, however, once removed from contact, the patients show a tendency to gradual improvement. (tr-auth)

8601

ON CONDITIONS OF WORK OF THE PERSONNEL OF X-RAY AND RADIOLOGICAL ROOMS. V. P. Vikturina, E. E. Troitskaya, T. P. Seletskaya, A. V. Frolova, and I. E. Pasinkova (State Inst. of Scientific Research in Roentgenology and Radiology). Vestnik Rentgenol. i Radiol. 32, No. 6, 82-7(1957). (In Russian)

An analysis is made of the permissible doses and protective measures for medical personnel working in radiology. (R.V.J.)

8602

INTUSSUSCEPTION AS A COMPLICATION OF RADIATION SICKNESS. E. A. Zuikova and I. Kasyanov (Inst. of Scientific Research in Roentgenology and Radiology). Vestnik Rentgenol. i Radiol. 32, No. 5, 89-92(1957). (In Russian)

The digestive tract is highly sensitive to ionizing radiation, and the changes taking place in it have a prominent place in the clinical picture of the radiation sickness. The secreting function of the digestive glands is upset, as well as the processes of digestion and absorption. The intestinal wall becomes extremely permeable. Motor function disorders are accompanied by peristaltic contractions, tenesmus. This finds its clinical expression in nausea, vomiting, colicky pains, and diarrhea. Marked disorders of the motor function can lead to intussusception, which complicates considerably the subsequent evolution of the radiation sickness. Three cases of intussusception of the thin and large bowels in dogs who had received a total x-ray dose of 500 r are described. Acute radiation sickness in these animals ran a more severe and rapid course than in the controls. All cases ended in death on the 6 to 10th day after irradiation with symptoms of intestinal obstruction. Morphological changes in the dead animals were typical of acute radiation sickness and differed from the irradiated control cases by more marked dystrophic changes in the liver, kidneys, and heart. (tr-auth)

8603

ATOMIC MEDICINE. Third Edition. Charles F. Behrens, ed. Baltimore, The Williams & Wilkins Company, 1959. 713p.

The second revision of Atomic Medicine emphasizes the rapid advances in research and development in this field during the past 10 years. It is pointed out that the advent of thermonuclear weapons has also increased the hazards of radiation for the general population. All but a few chapters have been extensively revised or rewritten, and additional chapters have been added. Twenty-five outstanding scientists have contributed their knowledge and experience to the compilation of this book. The scope and general background of atomic medicine and associated physics are reviewed. Fundamentals of the biological effects of radiation, the detection and measurement of radiation, the etiology, pathology, diagnosis, and therapy of radiation injuries, radiation protection, and permissible radiation dosage levels are discussed. Proved laboratory methods for diagnostic applications of radioisotopes are outlined in detail. A summary of the more important aspects of survival methods in atomic disaster, a discussion of nuclear weapons and the pathological effects of fall-out, and permissible dosage and risk factors are included. Uses of radioisotopes as biological tracers and as radiation sources in therapy are covered in detail. A discussion is included on the design and operation of laboratories employing radioisotopes for medical purposes. Applications of reactors and particle accelerators in medical research and therapy are discussed. Pertinent results from recent research are summarized, and lists of references and author and subject indexes are included. (C.H.)

8604

BIOLOGICAL EFFECTS OF EXTERNAL RADIATION. First Edition. Henry A. Blair, ed. New York, McGraw-Hill Book Company, Inc., 1954. 522p.

Results are reported from a series of studies on the biological effects of x radiation and the chronic effects of neutron irradiation. Topics discussed in detail include the effects of massive doses of x radiation on mortality in laboratory animals, pathological changes exhibited by animals exposed to single doses of x radiation, the effects of acute exposure to x radiation on the peripheral blood of experimental animals, an investigation of similarities in the reaction of dogs to radiation

and to callicerein, experiments on the cross-circulation of blood in animals, finger ridge changes in monkeys following x irradiation, experiments on the relation of mutation frequency to x-ray dose in Drosophila, comparative effects of x and β radiation in rabbits, the effects of exposure to whole-body x radiation administered in divided doses over long periods of time, pathological effects of repeated daily exposure to x radiation, blood chemistry studies in dogs exposed to chronic x radiation, the effect of short-wavelength radiations on human finger ridge detail, the influence of chronic irradiation with gamma rays at low dosages on the mutation rate in Drosophila, fast-neutron-irradiation procedures, and the clinical, pathological, and hematological effects of chronic neutron exposure. A list of references is included with each chapter, and a complete subject index is provided. (C.H.)

8605

CHEMICAL PROTECTION AGAINST DAMAGING RADIATION. MEASURING SOME BIOLOGICAL REACTIONS WITH A VERY SHORT TIME LAG. Hendrik Bernard Lamberts. Thesis, State Univ. of Groningen, 1958. (In Dutch)

An investigation was made to find some biological radiation reactions, measurable with a very short time lag, suitable for a rapid screening of substances on their protective properties against ionizing radiation. For this purpose the radiobiological effects in the macromolecular mucopolysaccharides as they are found in synovia, in tissues rich in mucopolysaccharides, and in the matrix of the dermis' connective tissue were investigated. Some experiments on radiation hemolysis of erythrocytes are described. A survey of experiments with nonionizing radiation is given. The effects of breathing pure oxygen, irradiation with UV light, and breathing of small concentrations of ozone were investigated in man. A survey was made on the possibilities of chemical protection against ionizing radiation. 101 references. (J.S.R.)

8606

PROGRESS IN RADIATION THERAPY. Franz Buschke, ed. New York, Grune & Stratton, 1958. 287p.

The history of radiation therapy and of the development of radiation sources for use in cancer therapy is reviewed. Topics discussed include the relative biological effectiveness of external beams of ionizing radiation, the time-dose relationship in radiotherapy, the modification of radiation effects by chemical means, the clinical significance of cytohistologic evaluation of radiation effects, renal embryoma, radiotherapy of malignant neoplasms, radiotherapy of nonmalignant diseases, clinical experience with ultra-fractionated roentgen therapy, and radiation therapy as a medical specialty. (C.H.)

8607

SYMPOSIUM ON INFORMATION THEORY IN BIOLOGY, GATLINBURG, TENNESSEE, OCTOBER 29-31, 1956. Hubert P. Yockey, ed. New York, Pergamon Press, 1958. 425p.

Principles of information theory are reviewed, and applications in biological studies are discussed. Topics covered include the storage and transfer of information, determination of information measures, destruction of information by ionizing radiation, applications of information theory in studies of aging and radiation damage, and information networks. An account is included of a round table discussion on the status of information theory in biology. Lists of references, author, and subject indexes are included. (C.H.)

CHEMISTRY

General

Refer also to abstracts 9437, 9438, and 9440.

8608 A/CONF.15/P/1649

PRODUCTION OF HEAVY WATER IN INDIA. D. C. Gami, D. Gupta, N. B. Prasad, and K. C. Sharma (Atomic Energy Establishment, Trombay, India). 17p.

The first heavy water plant in India is under construction at Nangal in the Punjab as a part of a large fertilizer-heavy water project. The main raw materials are air, water, and some 160,000 kw of electricity to be supplied from the Bhakhra hydro-electric station, which is under construction. The plant is designed to produce 390,000 tons of nitrolimestone fertilizer and over 14 tons of heavy water. Data on various processes, namely, (1) straight electrolytic cascade, (2) electrolytic cascade with catalytic exchange, (3) electrolytic cascade and ammonia distillation, and (4) electrolytic cascade and hydrogen distillation that had been considered for the production of heavy water are presented. It is concluded that the hydrogen distillation process with some pre-enrichment in a two or three stage electrolytic cascade is the most suitable process for the production of heavy water at Nangal. Estimates of amount of production and cost of production are also presented. (auth)

8609 AERE-C/R-2692

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE REACTIONS OF ZIRCONIUM AND ZIRCONIUM BASED ALLOYS WITH NITRIC AND NITRIC-HYDROFLUORIC ACIDS. PART I. HAZARDOUS ASPECTS. PART II. DISSOLUTION RATES. F. S. Martin and B. O. Field. Dec. 1958. 16p.

Hazardous aspects of the dissolution of zirconium–uranium alloys in nitric acid were studied. It is concluded that when nitric acid constitutes the major part of the dissolving solution (i.e., if fluoride concentrations are low), the safe dissolving of such alloys cannot be guaranteed. The explosive reactions observed are not of the detonation type, but appear to involve a rapid oxidative reaction between adsorbed or precipitated nitrates and finely divided metal (or metal in a low oxidation state) on the alloy surfaces. Some dissolution rates are reported for 5% U–Zircaloy-2 and for Zircaloy-2 in nitric acid–fluoride mixtures, in sulfuric acid catalyzed by ferric ion, and in anhydrous dinitrogen tetroxide in tributyl phosphate. (auth)

8610 CISE-61

Centro Informazioni Studi Esperienze, Milan.

IMPIANTI ELETTROLITICI CON COLONNE DI RECUPERO DEL DEUTERIO A REAZIONE DI SCAMBIO. I. STUDIO SCHEMATICO DELLA COLONNA A PIATTI MISTI E DI IMPIANTI A UN SOLO STADIO. IMPOSTAZIONE DEL CALCOLO DI UN IMPIANTO A 4 STADI. (Electrolytic Column Installation for Deuterium Recovery by the Exchange Reaction. I. Schematic Study of the Columns with Mixed Plates and of Installation with a Single Stage. Calculation of a 4 Stage Installation.) E. Cerrai, C. Marchetti, M. Silvestri, and S. Villani. July 30, 1954. 35p.

In the first section of a study of an electrolytic column installation for deuterium recovery by the exchange reaction, a schematic study is made of a column with

mixed plates of bubblers and catalysts. Single-stage installations with saturation plates, without saturation plates, with tapping above the electrolytic cell, and with infinite columns are considered. Preliminary calculations of a four-stage installation with infinite columns are also presented. (J.S.R.)

8611 CISE-62
Centro Informazioni Studi Esperienze, Milan.
IMPIANTI ELETTROLITICI CON COLONNE DI RECUPERO DEL DEUTERIO A REAZIONE DI SCAMBIO. II. STUDIO DI IMPIANTI A 4 STADI CON COLONNE A PIATTI MISTI, CON PARTICOLARE RIFERIMENTO ALLA RESA E AGLI ALTRI PARAMETRI CARATTERISTICI. (Electrolytic Column Installation for Deuterium Recovery by the Exchange Reaction. II. Study of a 4-stage Installation with Mixed Columns, with Particular Reference to Yield and Other Characteristics Parameters.) E. Cerrai, C. Marchetti, M. Silvestri, and S. Villani. July 30, 1954. 71p.

In the second part of the study on deuterium production, calculations on a four-stage installation are continued. An installation with infinite column and without distillation effects, an installation with infinite column and with distillation effects, installations with columns with a finite number of plates, columns with initial scavenger plates, and calculations of the volume of the catalyst are considered. (J.S.R.)

8612 CISE-63
Centro Informazioni Studi Esperienze, Milan.
IMPIANTI ELETTROLITICI CON COLONNE DI RECUPERO DEL DEUTERIO A REAZIONE DI SCAMBIO. III. STUDIO DI IMPIANTI A 4 STADI CON COLONNE COSTITUITE DA PIATTI A CONDENSAZIONE CON PARTICOLARE RIFERIMENTO ALLA RESA E AGLI ALTRI PARAMETRI CARATTERISTICI. CONSIDERAZIONI ECONOMICHE SUL LIMITE DI CONVENIENZA DEL RECUPERO DEL DEUTERIO. (Electrolytic Column Installation for Deuterium Recovery by the Exchange Reaction. III. Study of a 4-Stage Installation with Columns Constituted by Condensor Plates with Particular Reference to Yield and Other Characteristic Parameters. Economic Considerations on the Convenient Limits for Deuterium Recovery.) E. Cerrai, C. Marchetti, M. Silvestri, and S. Villani. July 30, 1954. 40p.

In the last section of a study on deuterium production, the enrichment and yield of a four-stage installation, the design of the recovery column, maximum yield and relative yield, and the dimensions of the column are considered. The efficiency of the Terni plant is calculated by means of successive additions of plates. In an appendix cost considerations are discussed. (J.S.R.)

8613 CRDC-811
Atomic Energy of Canada Ltd., Chalk River, Ont.
THE ACCURATE DETERMINATION OF MICROGRAM AMOUNTS OF BORON IN ALUMINUM AND ALUMINUM-URANIUM ALLOYS BY THE METHYL BORATE-CURCUMIN-OXALIC ACID METHOD. Iain H. Crocker. Oct. 1958. 26p. (AECL-744). $0.50(AECL).

A method was developed for the determination of boron in aluminum and aluminum-uranium alloys in which the boron concentration is 30 ppm or more. Boron is separated by distillation as methyl borate from a hydrochloric acid solution of the alloy and is determined spectrophotometrically by the boric acid-curcumin-oxalic acid color reaction. A precision of ±2% is attainable when the determination is performed with the utmost care. The accuracy is such that no bias need be given when a calibration curve is used. (auth)

8614 DMIC-Memo-9
Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
PREPARATION AND ANALYSIS OF TITANIUM-HYDROGEN STANDARD SAMPLES. Max J. Trzeciak. Feb. 9, 1959. 14p. Contract AF18(600)-1375.

The preparation of standard Ti-H samples for use in standardization and evaluation of analytical methods for gases in metals is given. Preparation of materials and hydridation procedure are described, and the results of sample analysis are compared with those of other laboratories. (J.R.D.)

8615 DOFL-TR-636
Diamond Ordnance Fuze Labs., Washington, D. C.
MEASUREMENT OF PARTICLE SIZE OF COMPONENTS OF GASLESS MIXTURES. R. H. Comyn, Mardelle L. Couch, and Robert E. McIntyre. Aug. 28, 1958. 36p. DOFL Project 30131.

The relationships between the blending and burning characteristics of gasless mixtures and the particle size of their ingredients are discussed in detail. Particle size methods used in current pyrotechnic specifications are shown to be inadequate for controlling the size of the ingredients of gasless mixtures. A number of known particle size methods are reviewed and their applicability to gasless mixtures are considered. Two methods are recommended for measuring the particle sizes of ingredients of gasless powders: The Brunauer-Emmett-Teller (B.E.T.; nitrogen adsorption) method for determining total surface area, and the Eagle-Picher Turbimetric method for measuring particle size distribution. (auth)

8616 GAT-244
Goodyear Atomic Corp., Portsmouth, Ohio.
CHEMICAL REACTIONS OF VARIOUS FLUORINE SYSTEMS. G. Stern and W. R. Brown. Jan. 9, 1959. 23p. Contract AT(33-2)-1. $0.75(OTS).

The chemical reactivity of the following fluorine systems was tested: fluorine-C-816 Oil (Perfluorodimethylcyclohexane); fluorine-C-437 Oil (2,2,3-trichloroheptafluorobutane); fluorine-Duo Seal Pump Oil; fluorine-Lube Oil; fluorine-Concentrated Sulfuric Acid; and fluorine-Concentrated Phosphoric Acid. The C-816 and C-437 oils are used as buffer solutions separating hydrocarbon oil from fluorine in the diaphragm system of pulsating pumps. Experimental test results indicated that both the C-816 and C-437 oils reacted vigorously with fluorine. This reaction is highly exothermic and contact between fluorine and either of the oils may be hazardous. The Duo Seal pump oil, lube oil, concentrated sulfuric acid, and concentrated phosphoric acid were considered as possible substitute compounds for the C-816 and C-437 oils. Each of these compounds was tested for chemical reactivity with fluorine. Experimental test results indicated that a vigorous reaction occurred for each system. These compounds, therefore, are not recommended as substitute materials for the C-816 and C-437 oils. (auth)

8617 GAT-T-571
Goodyear Atomic Corp., Portsmouth, Ohio.
X-RAY DIFFRACTION DATA ON METAL FLUORIDES AND SIMILAR COMPOUNDS. A Literature Search. R. D. Hamilton. Feb. 28, 1959. 41p. Contract AT(33-2)-1. $7.80(ph), $3.30(mf) OTS.

The results of a literature search which was conducted to obtain x-ray-diffraction data on a number of metal fluorides are presented. (auth)

8618 HW-58212
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
FORMAL OXIDATION POTENTIALS OF IRON, PLUTONIUM, AND NEPTUNIUM DETERMINED WITH A CONTROLLED POTENTIAL COULOMETER. R. W. Stromatt, R. M. Peekema, and F. A. Scott. Nov. 12, 1958. 23p. Contract [W-31-109-Eng-52]. $4.80(ph), $2.70(mf) OTS.

A controlled potential coulometric method was used to measure formal oxidation potentials of Fe, Pu, and Np couples in various acid solutions. In the coulometric method, the electrode potentials are measured directly with a reference and inert electrode couple, while the concentrations of the valence states of interest are adjusted by coulometric titrations. One serious limitation of the method is its inability to measure the potentials of irreversible couples. This was emphasized in the case of the Np(IV/V) couple. The standard oxidation potential of the Fe(II/III) couple determined by this method was −0.767 volts, which is in excellent agreement with the reported value of −0.771 volts. The difference is within the experimental error and can be attributed to junction potentials. A summary of the formal oxidation potentials determined by this method is tabulated. Some insight into the chemistry of these elements was gained by observing the behavior of their oxidation potentials in various media. Np(V) appeared to be somewhat unstable in HNO_3 solutions 6 N and greater, Fe(II) appeared to be very unstable in HNO_3 solutions 5 N and greater, and Pu(III) appeared to be very unstable in HNO_3 solutions 6 N and greater. All of the solutions contained sulfamic acid as a nitrite suppressor. Complex formation constants were estimated for the Np(VI) sulfate, Np(IV) nitrate, and Np(IV) chloride complexes as 13, 2.4, and 0.5, respectively, by comparing the formal oxidation potentials of the couples in the complexing media to the potentials of the couples in a noncomplexing medium. The difference in potentials of the Np(V/VI) couple in a noncomplexing medium and in 1 N H_2SO_4 indicates that Np(IV) is complexed as the disulfate in the 1 N H_2SO_4. (auth)

8619 IGO-AM/S-45
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE SPECTROGRAPHIC DETERMINATION OF CADMIUM IN URANIUM. 1958. 19p.

The uranium metal is dissolved in nitric acid. Cadmium, complexed as the dithizonate, is extracted into carbon tetrachloride and adsorbed on activated alumina. The alumina is examined spectrographically using an internal standard/carrier-distillation technique. (auth)

8620 IGO-AM/S-117
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE SPECTROGRAPHIC ANALYSIS OF URANIUM BY THE CARRIER-DISTILLATION METHOD. 1958. 22p.

The uranium metal is converted to U_3O_8 by direct ignition, and the oxide is mixed with a definite proportion of silver chloride carrier. The mixture is placed in a graphite cup which is made the anode for excitation in a d-c arc at 10 to 12 amps. Spectra are recorded photographically using a large glass/quartz spectrograph. Standard lines and limits of detection (ranging from 0.05 to 30 ppm) are given for the determination of the following elements: Au, Be, Bi, Co, Cr, Cu, Ga, Ge, Mn, Ni, Pb, Sn, Tl, V, Pd, Ba, K, and Li. (auth)

8621 IGO-AM/S-126
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE SPECTROGRAPHIC DETERMINATION OF RARE EARTHS IN URANIUM METAL. 1958. 26p.

The impurities are retained on a cellulose column after elution of the whole of the uranium using an ether–nitric acid mixed solvent. The column is ashed and the residue taken into solution from which the rare earths are precipitated first with calcium oxalate and finally co-precipitated with ferric hydroxide. The mixed hydroxides are ashed and then examined spectrographically, using a Jarrell-Ash grating spectrograph. The densities of the spectrum lines due to the rare earths are visually compared with those of iron added as an internal standard and the concentration values either obtained from a table of line-pair equalities or evaluated by a two-line calibration method. (auth)

8622 IGO-AM/W-184
United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.
THE ABSORPTIOMETRIC DETERMINATION OF IRON IN URANIUM PLANT SOLUTIONS AND PLANT INTERMEDIATES (aα DIPYRIDYL METHOD). 1958. 6p.

Plant solutions are normally in nitric acid; dissolution procedures for the various solid uranium intermediates are included. The iron is reduced to the ferrous state with hydroxylamine hydrochloride. Sodium acetate is added to buffer the solution to a pH of between 3 and 6. An acid solution of aα dipyridyl is added, forming the colored ferrous complex. Separation from uranium is effected by extraction of the complex into chloroform using a sodium alkyl sulfonate reagent as an extraction promoter. Iron is determined by measurement of the absorbancy of the chloroform extract on a Spekker absorptiometer with Ilford 604 filters. (auth)

8623 IGR-TN/C-336
United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
THE OXIDATION OF POTASSIUM. Report of Progress to January 31, 1956. P. B. Longton. May 14, 1956. 11p.

The reaction between dry oxygen and distilled potassium at constant pressure, in the pressure range 10 to 800 mm Hg and at temperatures from 25 to 250°C, was investigated. At temperatures below the ignition temperature (minimum 182°C), no reaction was detectable. The variation of ignition temperature with pressure has been found to be analogous to that exhibited by lithium and sodium, under similar conditions. (auth)

8624 KAPL-M-SMS-44
Knolls Atomic Power Lab., Schenectady, N. Y.
RESULTS OF HYDROGEN DISPERSION TESTS. G. H. Epstein and W. J. Paulus. Nov. 1, 1956. 11p. Contract W-31-109-Eng-52. $3.30(ph), $2.40(mf) OTS.

Experiments in adding large amounts of hydrogen to the TF-20 loop by injection proves that hydrogen dissolves almost immediately upon contact with the high-temperature primary loop water. Mixing is complete

and homogeneous. The combination of increased hydrogen receiver volume and the rapid dissolving action of the hot loop will ensure positive and complete dispersion of the hydrogen in the S3G/S4G plants. (J.E.D.)

8625 NAA-SR-1421
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
DETERMINATION OF FREE POTASSIUM METAL IN COLORED POTASSIUM CHLORIDE. Louis Silverman and Mary Shideler. Apr. 15, 1956. 13p. Contract AT-11-1-GEN-8. $3.30(ph), $2.40(mf) OTS.

A method for determining free potassium metal in colored alkali crystals was developed. The free potassium reacts with water to form potassium hydroxide, and the hydroxyl-ion concentration is determined by pH change. A particularly useful pH range of 5 to 9 was selected. Colored crystals were produced by the action of potassium vapor on halide crystals and the experimental results of the analysis of the colored potassium chloride crystals are shown to be within the 95% confidence level. (auth)

8626 NLCO-751
National Lead Co. of Ohio, Cincinnati.
DETERMINATION OF CHLORIDE IN URANIUM-BEARING MATERIALS BY A POTENTIOMETRIC TITRATION METHOD. Paul G. Laux and Ernest A. Brown. Nov. 3, 1958. 39p. Contract AT(30-1)-1156. $1.50(OTS).

A direct potentiometric titration method is described for the determination of chloride in the range of 0.005 to 0.15% in uranium-bearing feed materials. The titration is carried out to a predetermined equivalence potential in a 95% methanol–5% nitric acid medium. A silver wire-saturated calomel electrode system is used. The method is rapid, since no preliminary separation of the chloride is required. The major interferences for the titration are iron (III), vanadium (V), permanganate, nitrite, bromide, and iodide. The interference of all ions except bromide and iodide is prevented by the addition of ascorbic acid or ammonium hydroxide. A comparative study of the potentiometric and turbidimetric methods was made. Uranium ore concentrates, nitric acid, and aqueous feed samples were used in this study. Satisfactory agreement was obtained between the two methods, using these sample types. (auth)

8627 NP-7237
Polish Academy of Sciences, Inst. of Nuclear Research, Warsaw.
THE TRI-N-BUTYL PHOSPHATE (TBP)–DILUENT–HNO_3–H_2O SYSTEM. Report No. 51/IV. W. Korpak and C. Deptuła. Dec. 1958. 13p.

The distribution of nitric acid between water and a 5% solution of TBP was investigated in relation to the concentration of nitric acid in the aqueous phase. The experiments revealed the oxonic character of extraction of nitric acid with TBP, and the existence of four complexes is postulated. TBP dissolves in 95% nitric acid to form one phase. This is the basis for an approximate quantitative determination of TBP in mepasine. (auth)

8628 NRL-5129
Naval Research Lab., Washington, D. C.
ELECTROCHEMICAL MECHANISMS OF NOBLE-METAL/HYDROGEN SYSTEMS. PART II. PALLADIUM. J. P. Hoare, G. W. Castellan, and S. Schuldiner. Mar. 13, 1958. 45p. Projects NS 677-100 and NR 475-000.

The hydrogen-producing reactions on a β-palladium cathode were investigated and mechanisms were determined. By means of a palladium bielectrode it was possible to determine mechanisms on the anode and cathode surfaces of α-palladium and to study the migration of protons through the bielectrode. The relation between the hydrogen content of palladium and the resistance and potential was determined. The equilibrium potential anomalies in the palladium/hydrogen system were resolved by showing that the potential-determining reaction for α-palladium is an equilibrium between hydrogen ions in solution and hydrogen dissolved in the metal, whereas the potential-determining reaction on β-palladium is an equilibrium between hydrogen ions in solution and molecular hydrogen. It was also shown that when palladium is electrolytically charged with hydrogen its electrochemical behavior is different from that of palladium charged by exposure to hydrogen gas. The thermodynamics of these systems are discussed and a structural interpretation of the free energy relations is given. The mechanisms of the spontaneous solution of hydrogen in pure palladium in aqueous solution are given. (auth)

8629 NRL-5171
Naval Research Lab., Washington, D. C.
ELECTROCHEMICAL MECHANISMS OF NOBLE-METAL HYDROGEN SYSTEMS. PART III. ELECTRONIC CONFIGURATION AND CATALYTIC ACTIVITY. S. Schuldiner and J. P. Hoare. June 19, 1958. 13p. Project NR 475-000.

This report is the third of a series reviewing the experimental and theoretical findings of the electrochemical mechanisms of noble-metal/hydrogen systems. Relations between electronic configuration, the heat of adsorption of hydrogen atoms, catalytic activity, and the rate-determining step were experimentally demonstrated. It was shown that when the rate-determining step is an atomic desorption, the lower the atomic heat of adsorption, the higher the catalytic activity. When the slow discharge step is rate determining, the higher the atomic heat of adsorption, the higher the catalytic activity. A linear relation between the number of positive holes in the d-band of Ni–Pd–H alloys and their catalytic activity was shown. The systems studied are α and β palladium–hydrogen, nickel-palladium-hydrogen, and gold–palladium–hydrogen alloys. (auth)

8630 ORNL-2662
Oak Ridge National Lab., Tenn.
ANALYTICAL CHEMISTRY DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING DECEMBER 31, 1958. Mar. 3, 1959. 113p. Contract W-7405-eng-26. $2.50(OTS).

Activation Analyses (X-10). The use of neutron activation analysis in the determination of small amounts of many elements in a variety of materials is summarized. The analysis of water and of reactor materials and the determination of trace quantities of argon and oxygen are also reviewed briefly. Particle-size-distribution analyses, gamma monitoring, neutron-flux monitoring, radioactivity measurements, and the use of short-half-life radionuclides in analysis are also discussed. Analytical Instrumentation (X-10). The principles, descriptive details, current development status, and proposed applications and testing of instruments to be installed or constructed are presented briefly. A falling-stream cell will be used in one of the gamma monitors, and an elec-

tronic scan circuit will be tested for scanning the gamma spectrum of the flowing IAP stream. Two types of transducers for alpha monitors that continuously record the rate of alpha emission from the surface of the stream were tested. Design improvement of the a-c polarograph circuit, tests of a radio-frequency instrument for monitoring HNO_3, and construction of a gamma absorptiometer in which a chopper technique is used to minimize electrical drift and gamma emission from the stream itself are reported. The controlled-potential coulometric titrator has been redesigned, and a prototype has been built and tested. The ORNL model Q-1728 velocity-servo potentiometric titrators have been improved. A radiofrequency titration instrument, which has been used for the titration of thorium, was designed and fabricated. Design improvements have been made to the prototype of the controlled-potential and derivative polarograph. Significantly improved derivative polarograms are obtained with the redesigned analog type of derivative computer. The variables that determine the useful sensitivity limit of polarography are being investigated. Specialized equipment, including apparatus for controlled-potential coulometric titrations and for surface-area measurements, has been designed and fabricated for the analysis of radioactive samples. Instrumentation for chronopotentiometric analysis at transition times of about 1 sec has been built and tested. A new high-resolution, high-sensitivity, scanning, recording, single-beam flame spectrophotometer has been designed. HRP Laboratory (Y-12). Methods developed or adapted for use in the analysis of uranyl sulfate solutions included flame photometric methods for microgram quantities of Ag, Nd, and Fe and polarographic methods for Hg, Cu, Pb, Cd, and Cl. For the analysis of slurries of thorium oxide, new or improved methods were devised for the flame photometric determination of Al, colorimetric or fluorometric determination of Zr, removal of certain interferences in the colorimetric determination of Ti, polarographic determination of U, and dissolution of high-fired samples without loss of Cr and subsequent determination of the Cr. Other methods developed or evaluated included a procedure for the separation of Mo from interferences and determination by flame photometry, a fusion-pyrolysis procedure for removal of Ru from steel prior to its estimation colorimetrically, a procedure for the polarographic determination of U in Sn after volatilization of the major portion of the Sn as $SnCl_4$, the high-frequency titration of Th with EDTA or $H_2C_2O_4$, and a gamma counting method for establishing the fraction of ThO_2 settled in the determination of size distribution by a sedimentation procedure. Further work is reported on the application of fusion pyrolysis to the separation of fluoride and also chloride from ThO_2 and other materials. The effect of acetic acid concentration and pH on the extraction of Th with TTA in organic solvents was investigated. A similar study was also made of the extraction of Al and La in which the effect of pH, concentration and type of buffer used, type of organic solvent, and period of equilibration on the distribution ratio was evaluated. Ionic Analyses (X-10). A new method was developed for the coulometric titration of Eu. The coulometric determination of U in dissolver solutions has been studied. A new technique for the determination of Cu, U, and Ni in one sample of HR fuel has been developed. Polarographic determinations of Ba in tetramethyl ammonium iodide, U^{6+} in various acidic media, and Nb in molten and aqueous NH_4HF_2 have been evaluated. An amperometric titration method for the determination of Ba was also evaluated. A study was made of chemical changes in UO_2–Al reactor fuel elements during heat treatment. A method for the determination of the oxygen-to-uranium ratio in UO_2 has been developed. Automatic chelometric titrations of several metals, such as Y, Mg, Ca, Ni, and Bi, have been carried out by use of a mercury indicator electrode. The study of the thermometric titration of acids continued; the systems studied were Zr in HF, UO_2^{2+} in H_2SO_4 and in HNO_3, and Th in HNO_3. Thermometric redox and precipitation titrations were also studied. A spectrophotometric determination of small amounts of Zr in ThO_2 has been evaluated. Studies of the spectral properties of Eu^{2+} and Eu^{3+}, and of Li^6I(Eu) scintillation crystals were conducted. Studies have been made of a simultaneous spectrophotometric determination of Ce and Pu in fused salts, and of UO_2^{2+}, U^{4+}, and Cu^{2+} in 1 M H_2SO_4. Small amounts of H_2O in D_2O were determined spectrophotometrically. The spectrophotometric studies of the autoreduction of PuO_2^{2+} by products of the alpha-particle radiolysis of water continued. Mass Spectrometry (Y-12). Mass spectrometer research and development is reported. By means of thermal diffusion, Kr^{86} for use as a primary wavelength standard has been enriched to 99.97%. Optical and Electron Microscopy (X-10). Descriptions are given of a method for replicating crystals of thorium oxide for electron microscopy, a modification to and uses of an electrolytic stripping method for bulk oxides of steel, and details of the Faxfilm replica technique and its uses for electron microscopy. Use is made of a TV-monitoring-screen method for observing the action of charged submicro and micro particles in liquid media. Quality Control (X-10 and Y-12). A brief summary of the quality control program is given. Radiochemical Analyses (X-10). For 26 nuclides, measurements have been made of activation cross sections characteristic of neutrons of 195-kev energy. Instrumental techniques have been used in the identification and measurement of fission gases and fall-out activity, in the measurement of U^{232}, and in other problems. Radiochemical methods have been devised for the determination of Y^{91}, Nd^{147}, radiocesium, and U^{237}. Research on cyclotron-produced radionuclides and on solvent-extraction techniques continued. Raw Materials Laboratory (Y-12). The Raw Materials Laboratory studied the determination of the hydrogen content of paraffin, the use of gold plates in preparing 3 M H_2SO_4 solutions of Pu for gross-alpha counting, and the application of the dibenzoylmethane method for the determination of U. Reactor Projects Laboratory (Y-12). Investigation of the applicability of tri-n-octyl-phosphine oxide (TOPO) as an analytical reagent was extended to the extraction of cerium and tin. The effects of temperature on the solubility of TOPO in cyclohexane and on the extraction of HNO_3 were determined. The ultraviolet spectra of the uranium-TOPO adduct, $UO_2Cl_2 \cdot 2$(TOPO), were found to be useful in the direct determination of U in the organic phase in the presence of Th, which is also extracted by TOPO. Further data were obtained on the effect of concentration of HCl on the extraction of Nb and tantalum. Additional infrared spectra were obtained on films of metal-TOPO adducts. An ultraviolet spectrophotometric method for the direct determination of nitrate in TOPO-cyclohexane solutions was developed. The iron-TOPO adduct was found to react with o-phenanthroline in cyclohexane solution to give the familar ferrous–o-phenanthroline complex, thereby providing another ex-

ample of a direct colorimetric determination in a nonaqueous medium. With respect to fluoride salt analysis, methods were evaluated for the determination of oxides in mixtures of salts, and for Y and Mg. Progress is reported on the development of a cell in which the spectra of molten fluoride salts can be measured. Other methods investigated were microdetermination of fluoride ion in Y metal, ultraviolet spectrophotometric determination of cerium, and determination of boron in nitrate solutions. Spectrochemical and X-Ray Analyses (X-10 and Y-12). Ammonium bisulfate is superior to potassium pyrosulfate for use in processing samples for spectrochemical analysis because it can be volatilized completely after use, it does not solidify during fusion, and it does not attack platinum or glass. The identity of an acid matrix does not affect the intensity ratio obtained in a porous-cup exposure at the ~1% acid level but does so in many cases at the 10% acid level. The introduction of helium into the analytical gap through a hollow counter-electrode effects a marked increase in the line-background ratio of porous-cup exposures. In the use of triisooctylamine for the extraction of Zr from 9 N HCl, it is necessary to prepare the reagent immediately before use. X-ray fluorescence techniques have been developed for determining U, Nb, and Zr in the presence of each other. The conversion of an x-ray instrument for x-ray absorption analysis of solutions is under way. Service Analyses. A summary of the service analyses is given in tabular form, and special problems are discussed briefly. (For preceding period see ORNL-2453.) (T.R.H.)

8631 RDB(C)/TN-109

United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
THE DISTILLATION OF MIXED CHLORIDES OBTAINED BY THE CHLORINATION OF FERRO-NIOBIUM. J. S. Broadley and B. R. Steele. Jan. 10, 1955. 8p.

The mixed chlorides obtained by the chlorination of ferro-niobium have been fractionally distilled. A complete separation from ferric chloride has been achieved and the results indicate that pure niobium pentachloride could be prepared by this method. (auth)

8632 RDB(W)/TN-77

Gt. Brit. Windscale Works, Sellafield, Cumb., England.
DISSOLUTION OF A PLUTONIUM METAL BILLET IN NITRIC ACID. V. J. Wilkinson and J. A. Peacegood. June 1953. 7p.

A 240 gram billet of plutonium metal was dissolved completely in one liter of boiling 16N nitric acid to which 4 grams of hydrofluoric acid were added. Under these conditions a solution rate of at least 0.2 grams/cm^2/hour was achieved. (auth)

8633 UCRL-8508

California. Univ., Berkeley. Radiation Lab.
THE SPECTRA OF SOME ALIPHATIC ALDEHYDES AND THEIR MONODEUTERO DERIVATIVES (Part I of Thesis). Earl Fremont Worden, Jr. Oct. 9, 1958. 100p. Contract W-7405-eng-48. $2.50(OTS).

Part II of Thesis issued as UCRL-8509.

An investigation of the infrared and near-ultraviolet spectra of three aliphatic aldehydes and their monodeutero derivatives is described. The infrared spectra of the acetaldehydes (CH_3CHO and CH_3CDO) were in agreement with work reported recently. A few new bands are reported and discussed. The infrared spectra of C_2H_5CHO, C_2H_5CDO, C_3H_7CHO, and C_3H_7CDO at 450 to 4000 cm^{-1} were observed, and an assignment of the observed bands was made. The weak absorption of the aliphatic aldehydes which extends from λ3500 A to λ2300 A was investigated. The strength of the absorption (f-value) is decreased by deuterium substitution at the aldehyde CHO group. The decrease in the f-value can be accounted for by the theory of vibrationally induced electronic transitions. The effect of isotopic substitution on the intensity of symmetry-allowed as well as symmetry-forbidden (vibrationally allowed) electronic transitions in polyatomic molecules is discussed. (auth)

8634 UCRL-8509

California. Univ., Berkeley. Radiation Lab.
HIGH INTENSITY LIGHT SOURCES (Part II of Thesis). Earl Fremont Worden, Jr. Oct. 9, 1958. 107p. Contract W-7405-eng-48. $2.50(OTS).

Part I of Thesis issued as UCRL-8508.

A stable carbon arc operated in controlled atmosphere is described. The arc was designed to serve as a light source during lifetime studies of the $B^2\Sigma$ state of the CN molecule. The CN radiation from the plasma of the arc was investigated and found to have a brightness temperature of 5500°K at λ3883 A. This is considerably higher than an estimate of the value required for lifetime measurements. The stability of the carbon arc under various conditions is discussed. For successful lifetime measurements, the light source employed must have a high brightness temperature (intensity). A method for the determination of the brightness temperature of a light source at a specific wave length is described. The method was used for determining the brightness temperatures of some available light sources. Sodium, thallium, and mercury discharge lamps, a medium-pressure mercury arc lamp, and the carbon arc were studied. (auth)

8635 UCRL-8575

California. Univ., Berkeley. Lawrence Radiation Lab.
BIO-ORGANIC CHEMISTRY QUARTERLY REPORT [FOR] SEPTEMBER, OCTOBER, NOVEMBER 1958. Edward L. Bennett, ed. Dec. 15, 1958. 43p. Contract W-7405-eng-48. $1.25(OTS).

The exchange tritium labeling of organic compounds by exposure to tritium gas with an external source of radiation is described. Studies have shown that C^{14} can be introduced into organic compounds by bombardment with C^{14} ions. Kinetic studies of radiation damage in choline chloride are reported. Some organic electron donor-acceptor pairs in the solid state have been characterized by their paramagnetism and semiconductivity. The sealed-tube combustion of organic compounds with a copper–copper oxide mixture has been used extensively in the laboratory for the precision assay of C^{14}, using ionization chambers. The preparation of Hamamelonic acid is presented. Chlorella pyrenoidosa, suspended in a nutrient solution, grown in a bright light, and aerated with air containing $C^{14}O_2$, produces many substances containing C^{14}. These compounds have been analyzed by chromatography and radioautography. The possibility of producing a recessive lethal mutation in Drosophila melanogaster by treatment with D_2O has been investigated, by using a modification of the Muller test. (For preceding period see UCRL-8457.) (W.L.H.)

8636 WAPD-BT-11

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. Dec. 1958. 148p. Contract AT-11-1-Gen-14. $3.00(OTS).

Ten papers on Bettis Plant chemistry investigations related to reactor development are presented. Separate abstracts have been prepared for each paper. (T.R.H.)

8637 WAPD-BT-11(p.1-17)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
CONTAMINATION EFFECTS IN PRESSURIZED WATER REACTORS: THE EFFECTS OF SURFACE FINISH ON CONTAMINATION BY PARTICULATE ACTIVITIES. L. A. Waldman. p.1-17 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 17p.

Tests were performed with metal samples having different surface finishes to determine whether the finish of pressurized water reactor primary coolant piping and components was an important variable in contamination by particulate activities. The results of these tests showed nearly equivalent contamination for various machined surfaces ranging from 2–250 μin., with sand-blasted surfaces becoming about 5 to 10 times more contaminated, and electropolished surfaces becoming about ½ as contaminated as the machined surfaces. It is concluded that surface finish is not an important variable for particulate contamination of machined surfaces when compared to the probable effects of cracks, crevices, and coolant flow eddies in pressurized water reactors. (auth)

8638 WAPD-BT-11(p.18-28)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
VAN DE GRAAFF STUDY: THIRD INTERIM REPORT ON THE DEPOSITION OF CORROSION PRODUCTS UNDER IRRADIATION. G. P. Simon. p.18-28 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 11p.

Van de Graaff studies were undertaken to determine what variables are involved in the phenomenon of preferential deposition of crud on fuel element surfaces. Previous work indicates that irradiation of freshly-formed corrosion products causes a marked increase in the amount of deposition. Reactions are postulated which would account for the experimentally uncovered facts that, under that ionizing radiation, an increased concentration of oxygen increases the release rate of corrosion products but decreases the amount of deposition of these products. (auth)

8639 WAPD-BT-11(p.29-37)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THERMAL STABILITY OF AQUEOUS SOLUTIONS OF SOME DECONTAMINATION REAGENTS FOR PRESSURIZED WATER REACTORS. H. A. Droll. p.29-37 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 9p.

Chemical decontamination of loop systems should become more rapid as the temperature is increased; however, the decomposition rates of the chemicals must be known to determine what solution replenishment rates are required to maintain the desired concentrations. Six reagents, tested in autoclaves for at least one hour at 300° and 400°F, all decomposed fairly rapidly, with decomposition significantly more rapid at 400°F. Of the reagents tested, the complexing agents citric acid, the disodium salt of EDTA and catechol appear to be the most stable. (auth)

8640 WAPD-BT-11(p.53-62)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
FLOCCULATION-ADSORPTION WASTE DISPOSAL TREATMENT INVESTIGATION FOR HOT LAUNDRY AND DECONTAMINATION ROOM WASTES. R. Lloyd and W. T. Lindsay, Jr. p.53-62 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 10p.

Flocculation-adsorption waste disposal methods are investigated for treatment of PWR hot laundry and decontamination room wastes. Compositions of these wastes are discussed. Three flocculation-adsorption procedures are tested and prove satisfactory for use with dilution as an alternate or supplement for the 50-gph evaporator at Shippingport. (auth)

8641 WAPD-BT-11(p.81-103)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE CHEMICAL AND SPECTROCHEMICAL ANALYSIS OF ZIRCONIUM AND ZIRCALOY. G. W. Goward and R. M. Jacobs. p.81-103 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 23p.

The development and use of chemical and spectrochemical procedures at the Bettis Plant for the analysis of zirconium and the Zircaloy alloys are described. In addition, the establishment of certain reference standards, some of the difficulties encountered in the analysis, and plans for resolving the difficulties are discussed. (T.R.H.)

8642 WAPD-BT-11(p.104-19)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE CORROSION TESTING OF CROLOY 16-1. L. R. Scharfstein and W. F. Brindley. p.104-19 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 16p.

In partial qualification of a new material (Croloy 16-1) for steam generator tubing, a series of corrosion tests were conducted in primary and secondary water under a wide range of conditions. Croloy 16-1 exhibits general corrosion resistance between austenitic stainless steel and carbon steel without the susceptibility for chloride stress corrosion shown by austenitic stainless steel and a lesser tendency for pitting corrosion than carbon steel. The material appears promising for steam generator application. (auth)

8643 WAPD-BT-11(p.120-8)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
TORSIONAL PROPERTIES OF HAYNES 25 AND INCONEL-X SPRING ALLOYS. R. E. Myers and J. V. Alger. p.120-8 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 9p.

Investigation was made to determine the modulus of rigidity, proof stress, and yield stress in torsion as functions of test temperature and wire size for Haynes 25 and Inconel-X. Samples of Haynes 25 at 15%, 30%, and 40% cold-reduction and aging as well as samples of Inconel-X No. 1 Temper were tested in an apparatus developed for determining the torsional properties of small-diameter wire. Linear regression analysis of the moduli data, and graphs of the other torsional properties for the temperature range between 70 and 600°F are presented. (auth)

8644 WAPD-BT-11(p.129-41)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
EVALUATION OF SPRING RELAXATION. J. V. Alger and L. M. Skupien. p.129-41 [of] BETTIS TECHNICAL REVIEW. REACTOR CHEMISTRY AND PLANT MATERIALS. 13p.

Spring load-relaxation and corrosion tests were conducted on Haynes Alloy, Inconel-X, and Cobenium Alloy springs to determine the extent of possible application

of these materials for control rod drive mechanisms and valve springs in nuclear reactors. Results indicated that the materials were suitable dependent upon temperature and stress application. Iso-Elastic springs were also tested for reactor instrument applications involving variable service temperature. (auth)

8645 WAPD-CTA(GLA)-162-10
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE SPECTROCHEMICAL DETERMINATION OF RESIDUAL HAFNIUM IN ZIRCONIUM AND ZIRCONIUM ALLOYS USING D.C. ARC EXCITATION AND A BARIUM FLUORIDE FLUX. G. J. Harter and R. F. Farrell. Oct. 22, 1958. 6p. $1.80(ph), $1.80(mf) OTS.

This method is used to determine residual hafnium in zirconium and Zircaloy from 30 parts per million up to 300 parts per million. By selection of suitable line pairs the method may be extended to include other concentration ranges. The oxidized sample is mixed with a one-to-one barium fluoride–graphite mixture and pressed into a $\frac{1}{4}$ in. diameter, 2 mm deep electrode. Excitation of the sample is provided by high amperage d-c arc. Spectra are recorded photographically, and transmittance is determined for the analytical lines by means of a conventional microphotometer. The transmittances are converted to relative intensities using an emulsion calibration curve. Intensity ratios are calculated for the analytical line pairs and concentrations determined from working curves. (auth)

8646 AEC-tr-3277
STRUCTURE OF THE REACTION PRODUCTS OF ALKALI METALS ON GRAPHITE. A. Schleede and M. Wellmann. Translated by K. S. Bevis (Savannah River Lab.) From Z. physik. Chem. (Leipzig) 18B, 1-28(1932). 27p. $4.80(ph), $1.70(mf) JCL or LC.

Experiments were conducted to determine the extent and manner of graphite lattice changes in the absorption of potassium, rubidium, or cesium. The formation-type adsorption characteristics of these metals on graphite are of interest. Reagent preparation and experimental procedure are described, and results of x-ray structural analysis are presented. It was found that the three products acted alike and that the graphite, when freed of the alkali metals, has the same structure as the starting product. It is believed that the phenomenon consists of surface adsorption on the individual carbon surfaces of the graphite layer lattice. (J.R.D.)

8647 AEC-tr-3512
DEPENDENCE OF THE FREQUENCY OF PARTICLE SIZES IN AN OIL-IN-WATER EMULSION ON THE STIRRING VELOCITY. G. F. Huttig and H. Stadler. Translated by K. S. Bevis (Savannah River Lab.) from Monatsh. Chem. 88, 150-9(1957). 10p. $1.80(ph), $1.80(mf) JCL or LC.

A series of stirring experiments using emulsions of 1-methyl naphthalene in water is described. It was found that with unchanged mixing order for each rotational velocity of the stirrer, there is a predetermined frequency distribution of the droplet diameter characteristic, which is independent of the initial condition (finely or coarsely dispersed) of the emulsion when the stirring began. The observed frequency distribution can be reproduced in equilibrium. (J.R.D.)

8648 AEC-tr-3572
OPTICAL PROPERTIES AND CHEMICAL STRUCTURE OF ANTHRACENE-POLYSTYRENE PLASTICS. E. V. Anufriyeva, M. V. Vol'kenshtein, and M. M. Koton. Translated by Lydia Venters (Argonne National Lab.) from Zhur. Fiz. Khim. 31, 1532-41(1957). 12p. $3.30 (ph), $2.40(mf) JCL or LC.

The absorption and a fluorescence spectra and also the durations of luminescence of the system anthracene (its derivatives)–polystyrene were investigated. The investigations indicate that in the polymerization of styrene containing dissolved anthracene, part of the molecules of the latter adds to ends of the polymer chains, substituting the 9-hydrogen atom for the chain radical with rupture of the double bonds in the molecule. This leads to considerable change in the optical properties of the anthracene, its spectrum shifting towards the long wave region, and to increased duration of luminescence from 5.6×10^{-9} for the free anthracene to 14×10^{-9} sec for the anthracene bound to the polymer. On substituting in the 9, 10 positions of anthracene, the character of the interaction of the luminophor with styrene changes. 9, 10-Diphenyl- and 9, 10-dichloroanthracene evidently do not interact with styrene since their optical properties do not change during the process. Part of the molecules of 9-chloro- and 9-methylanthracene adds to the chain polymer during polymerization of styrene, the hydrogen atom in the 10 position being substituted. The interaction of anthracene and of its 9-substituents with styrene during the polymerization process explains the retardation effect of these luminophors on the process and the smaller molecular weights of the polymers formed. (J.H.M.)

8649 AEC-tr-3595
VIBRATION SPECTRA OF MOLTEN, GLASSY, AND CRYSTALLINE, HIGHLY POLYMERIZED PHOSPHATES. W. Bues and H. W. Gehrke. Translated by G. M. Wolten (Atomics International) from Z. anorg. u. allgem. Chem. 288, 307-23(1956). 36p. (Includes original, 17p.). $6.30(ph), $3.00(mf) JCL or LC.

Raman spectra of melts of $NaPO_3$ and KPO_3 are described and assigned. These spectra are compared with the infrared spectra, in the rock salt region, of Kurrol's potassium salt and Kurrol's sodium salt B as well as the spectrum of sodium trimetaphosphate. Two different chain arrangements with a periodicity of two are discussed for Kurrol's sodium and potassium salts. The melts of the phosphates still exhibit a certain ordering of the chains. The P_3O_9 ion in the crystal has the symmetry C_{3v}. (auth)

8650 AEC-tr-3601
ON THE LIGHT SCATTERING METHOD OF INVESTIGATING THE POLYDISPERSITY OF POLYMERS. B. E. Eskin and M. G. Okuneva. Translated by A. L. Monks (Oak Ridge National Lab.) from Zhur. Fiz. Khim. 32, 1532-5(1958). 7p. $1.80(ph), $1.80(mf) JCL or LC.

The angular distribution of light scattered by solutions of fractionated polystyrene samples and their mixtures in butanone was investigated. The average molecular weights of the mixtures as determined by the scattering of light are in agreement with values computed from the weight composition of the mixture. (J.E.D.)

8651 CEA-tr-R-348
L'ANALOGIE ENTRE L'ECHANGE ISOTOPIQUE DANS LES COLONNES A CONTRE-COURANT ET LES PROCESSUS D'ADSORPTION. (The Analogy between Ion Exchange in Counter-Current Columns and the Processes of Adsorption.) A. M. Rozen. Translated into French from Doklady Akad. Nauk S.S.S.R. 108, 122-5(1956). 13p.

The analogy between isotopic exchange in counter-

current columns and the processes of adsorption is discussed on the basis of the classical equation for mass transfer. As an example the reaction $H_2O^{18} + \frac{1}{2} CO_2^{16} = H_2O^{16} + \frac{1}{2} CO_2^{18}$ is used for the calculation of the isotopic exchange from the mass transfer equation. (J.S.R.)

8652 CEA-tr-A-242
DOSAGE DU CÉRIUM PAR SPECTROPHOTOMÉTRIE. (Spectrophotometric Determination of Cerium.) L. Holleck, G. Liebold, and G. Weidmann. Translated into French from Angew. Chem. 68, 522(1956). 5p.

Cerium, in the presence of other rare earths, can be determined spectrophotometrically by use of the maximum at 2955 A. In the concentration range studied, between 10^{-3} and 2×10^{-2} M, the concentration is proportional to the extinction of this maximum. A comparison of the results with those obtained by an iodometric determination shows that superiority of spectrophotometric analysis for very low cerium concentrations. Yttrium oxides will interfere, the gadolinium maximum at 2729 A does not interfere. (J.S.R.)

8653 CEA-tr-A-255
CINÉTIQUE DE L'ÉCHANGE D'IONS. (Kinetics of Ion Exchange.) F. Helfferich. Translated into French by B. Moreau from Angew. Chem. 68, 693-8(1956). 25p.

The diffusion of ions to the interior of an exchanger or across a film of adherent liquid determines the velocity of ion exchange. The application of Fick's first law leads to a complete theory of isotopic exchange which is confirmed by experiment. For the exchange of ions of different mobilities or valence, it is still difficult from the mathematical viewpoint to consider the diffusion potential which is formed. In addition, the effect of the activity and swelling coefficients can be determined only qualitatively. A decisive role on the velocity of exchange is played by the coefficients of self-diffusion in the exchanger. The experimental results, the dependence which exists between the valences, the size of the ions, the structure and concentration in solid ions of the exchanger, and the concentration of the contacting solution are discussed. 28 references. (tr-auth)

8654 CEA-TR-R-273
VALENCES "ANORMALES" DES ÉLÉMENTS DES TERRES RARES DANS LE PROCESSUS DE LEUR SÉPARATION. I. RÉDUCTION ÉLECTROLYTIQUE DE L'YTTERBIUM. ("Abnormal" Valences of Rare Earth Elements in the Processes of Their Separation. I. Electrolytic Reduction of Ytterbium.) D. I. Ryabtchikov, Yu. S. Sklyarenko, and N. S. Stroganova. Translated into French from Zhur. Neorg. Khim. 1, 1954-67(1956). 27p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 4, as abstract No. 12306.

8655 CEA-TR-R-364
DÉTERMINATION COLORIMÉTRIQUE DU ZIRCONIUM. (Colorimetric Determination of Zirconium.) V. I. Kuznetzov (Kouznetzov), L. M. Budanova (Boudanova), and T. V. Matrossova. Translated into French by B. B. Vinogradoff from Zavodskaya Lab. 22, 406-12(1957). 20p.

The characteristics of the reactions in the analysis of zirconium ions are discussed as an introduction to a description of the colorimetric determination of zirconium with arsenazo. The effect of other elements on the determination was studied. The method for the determination in pure solutions of Zr and in alloys of aluminum and magnesium is given. 27 references. (J.S.R.)

8656 CEA-tr-R-370
DÉTERMINATION DES IMPURETÉS ORGANIQUES À LA SURFACE DES PIÈCES MÉTALLIQUES PAR LA MÉTHODE SPECTROGRAPHIQUE. (Determination of the Organic Impurities on the Surfaces of Metallic Pieces by the Spectrographic Method.) R. N. Rubinshtein (Roubinstein) and N. G. Karpel. Translated into French from Zavodskaya Lab. 22, 1327-30(1956). 10p.

Spectrographic methods using both the condensed spark and high frequency spark were investigated for the determination of organic impurities on the surface of metallic pieces. The results obtained with the condensed spark confirm the possibility of determining organic impurities by a determination of the hydrogen, but the sensitivity of the method for the low concentrations used was insufficient. The high-frequency spark method is described in detail, and it can be used for the determination of organic impurities on metal surfaces after cleaning. (J.S.R.)

8657 CEA-tr-R-387
QUELQUES EXPÉRIENCES DE SYNTHÈSE ARTIFICIELLE DE L'URANINITE. (Some Experiences on the Artificial Synthesis of Uraninite.) G. B. Naumov (Naoumov) and K. I. Tobelko. Translated into French by B. de Trezvinsky from Geokhimiya 4, 24-7(1956). 9p.

This paper was previously abstracted from the original language and appears in NSA, Vol 12, as abstract No. 10517.

8658 CEA-tr-R-390
PROPRIÉTÉS DE CERTAINS SCINTILLATEURS PLASTIQUES. (Properties of Some Plastic Scintillators.) M. M. Koton, U. N. Panov, A. N. Pissarevskii (Pissarevsky), and T. V. Timofeeva. Translated into French from Pribory i Tekh. Ekspt. No. 1, 49-55(1957). 21p.

Investigations on polystyrols containing n-terphenyl, n-terphenyl and 1,6-diphenylhexatriene, and 1,1,4,4-tetraphenylbutadiene are reported. The data obtained for the luminescent yield of the scintillation permit the establishment of the optimum concentrations of additions (2%). The study of the absorption and luminescent spectra, as well as the study of the illumination duration, furnished the most efficient characteristics of scintillating plastic masses. (tr-auth)

8659 CEA-tr-R-560
PARTICULARITÉS THERMODYNAMIQUES ET CINÉTIQUES DES RÉACTIONS D'ÉCHANGE ISOTOPIQUE DE L'HYDROGÈNE. (Thermodynamic and Kinetic Details of the Isotopic Exchange Reactions of Hydrogen.) Ya. M. Varchavskii (Varchavsky) and S. E. Weissberg. Translated into French by B. Vinogradoff from Uspekhi Khim. 26, 1434-68(1957). 71p.

A review is presented of the results of the most important investigations on the thermodynamics and kinetics of isotopic exchange reactions. Although the purpose of the review is the study of deuterium and the majority of the works cited refer to isotopic exchange in hydrogen, the consideration of the general laws and the establishment of the basic equation are given in a form applicable to isotopes of any element. In the discussion the works on deuterium will be used since the isotopic effects are the sharpest in the case of hydrogen isotopes. 76 references. (J.S.R.)

8660 CEA-tr-R-570
OXYDABILITÉ DU MAGNÉSIUM À L'AIR À DES TEMPÉRATURES MODÉRÉMENT ÉLEVÉES AINSI QU'AUX HAUTES TEMPÉRATURES. (Oxidability of Magnesium in Air at Moderately High Temperatures as Well as at High Temperatures.) A. P. Belyaev (Beliaev). Translated into French from Zhur. Priklad. Khim. 30, 397-1400(1957). 9p.

The rate of oxidation of magnesium in air was studied by determining the increase in weight of samples heated to 200, 400, 560, 600, and 625°C. The results show that the average rate of oxidation is zero for samples heated up to 400°C. A perceptible oxidation occurs after heating for two hours at 560°C. The samples at 600°C flame at the 180th minute of heating and at the 15th minute of heating at 625°C. (J.S.R.)

8661 CEA-tr-R-577
MÉTHODES D'ANALYSE ISOTOPIQUE DE L'EAU. (Methods of Isotopic Analysis of Water.) A. I. Shatenstein (A. J. Chatechtein) and E. N. Zyaguntzeva (Zviaguintzeva). Translated into French from Zhur. Anal. Khim. 12, 516-22(1957). 20p.

A float method is described for measurements of differences in densities. The method permits an isotopic analysis of natural waters with a precision of ±0.0002 at. % of D or O^{18}. A thermostat assuring a constant temperature with a precision of ±0.0005° is also described. (tr-auth)

8662 CEA-tr-R-578
ANALYSE SPECTRALE PAR LA MÉTHODE DE L'ÉVAPORATION. COMMUNICATION II. DOSAGE DES IMPURETES DANS LES COMPOSES DU Th ET Be PAR ÉVAPORATION SOUS VIDE. (Spectral Analysis by the Evaporation Method. II. Determination of the Impurities in the Compounds of Thorium and Beryllium by Evaporation in Vacuum.) A. N. Zaĭdel, N. I. Kaliteevskii (Kaliteevsky), L. V. Lipis, and M. P. Chaĭka (Tchaika). Translated into French from Zhur. Anal. Khim. 12, 17-22(1957). 15p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 6288.

8663 CEA-tr-R-580
MÉTHODES DE PRÉPARATION DES MATIÈRES PLASTIQUES A SCINTILLATIONS EFFICACES. (Methods for the Preparation of Plastic Materials with Efficient Scintillations.) N. A. Adrova and M. M. Koton (Cotone). Translated into French by B. Vinogradoff from Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk, No. 6, 758-60(1957). 6p.

High-purity 2,4-di-[2(5-phenyloxazolyl)] benzene was prepared to be used either as an addition product to the plastic scintillator base or as a sensitizer of the base. The method used for the preparation of the scintillation plastic is described. The effects of 2,4-di-[2(5-phenyloxazolyl)] benzene were determined. (J.S.R.)

8664 CEA-tr-X-75
CONTRIBUTION A L'ÉTUDE DE LA GRANULOMÉTRIE DES PARTICULES. VII. INFLUENCE DE QUELQUES AGENTS PEPTISANTS SUR LA GRANULOMÉTRIE PAR LA METHODE DE SÉDIMENTATION. (Contribution to the Study of the Granulometry of Particles. VII. Effect of Some Peptizing Agents on Granulometry by the Sedimentation Method.) E. Suito, M. Arakawa, and N. Bamba. Translated into French from Kôgyô Kagaku Zasshi 59, 303-6(1956). 28p.

The results of investigations on the effects of various peptizing agents on the dispersion of aqueous suspension of calcium carbonate particles are reported. Either sedimentation by coagulation or free sedimentation was produced in the suspension according to the nature and concentration of the peptizing agent added. In sedimentation by coagulation, the volume of sedimentation is large and the apparent granulometry of the particles is also large. In the case of free sedimentation the specific volume of sedimentation is small and the apparent granulometry of the particles is very near the actual size of colloidal particles. There is a parallel relationship between the specific volume of sedimentation, the apparent granulometry, and the specific viscosity of the colloidal suspensions. The peptizing power of reagents obeys the Hofmeister series. However, the phosphates and water glass solution are more effective than sodium citrate which is the most active peptizer of this series. It is noted that sodium hexametaphosphate is the best of the dispersants studied. (tr-auth)

8665 IGRL-T/R-81
THE SEPARATION OF RADIOACTIVE RARE-EARTH ELEMENTS BY ION-EXCHANGE. B. K. Preobrazhenskii (Preobrazhensky), A. V. Kalyamin, and O. M. Lilova. Translated by E. G. Peters (U.K.A.E.A., Risley) from Zhur. Neorg. Khim. 2, 1164-6(1957). 6p.

The possibility of using home-produced KU-2 cation resin for the rapid separation of radioactive rare-earth elements in small columns has been proven. Equilibrium is attained on KU-2X6 resin several times faster than on Bowex-50X12, and this enables more rapid separations. The separation of two elements, Lu and Yb, has been carried out in as little as five minutes. Good separation of Y and Dy has also been obtained. (auth)

8666 NP-tr-226
DETERMINATION OF OXYGEN IN METALS AND OXIDES WITH SULFUR MONOCHLORIDE. K. E. Kleiner. Translated by B. W. Kuvshinoff (Johns Hopkins Univ.) from Ukrain. Khim. Zhur. 22, (1956). 9p. $0.50(OTS).

Methods of determining small quantities of oxygen in metals containing SiO_2, Al_2O_3, B_2O_3, and other similar oxides are complicated or unreliable, owing to the stability of the bonds between such elements and oxygen. The difference in heats of formation of the oxides mentioned and the corresponding sulfides is very great, and therefore these oxides do not react with sulfur. The cited condition limits the scope of use of the "sulfur method." The simultaneous use of chlorine and sulfur, in the form of S_2Cl_2, with which the oxygen of the oxides combines into sulfur dioxide, is a more effective method. In analysis of various minerals, sulfur monochloride has already been suggested for determining the metals composing them. Calculation from thermochemical data shows that at 1000° the reaction between sulfur monochloride and SiO_2, Al_2O_3, BeO, MgO, and especially Fe_2O_3, MnO, and Cu_2O, is accompanied by a positive heat effect. (auth)

8667 TT-791
SOME PROBLEMS OF CHAIN REACTIONS (SENSITIZATION). (O Nekotorykh Problemakh Tsephykh Reaktsii (Voprosy Initsiirovaniia).) N. N. Semenov. Translated by G. Belkov (National Research Council of Canada) from Vestnik Akad. Nauk S.S.S.R. 7, 3-15(1956). 24p.

A detailed study is presented of the chemical mechanism of chain reactions, the development of methods for obtaining free radicals, and the properties of free

radicals. Explanations are given for the connection between the structure of radicals and their chemical activity. The problems of sensitization of chain reactions are discussed. (J.E.D.)

8668

CARBON POSITIONS IN URANIUM CARBIDES. A. E. Austin (Battelle Memorial Inst., Columbus, Ohio). Acta Cryst. 12, 159-61(1959) Feb.

The carbon atom positions in uranium carbides have been determined from neutron diffraction data. UC is face-centered cubic with sodium chloride structure. U_2C_3 is body-centered cubic with space group $I\bar{4}3d$, and carbon atoms have one parameter of 0.295 with carbon–carbon bond distance of 1.295 A. UC_2 is tetragonal with space group I4/mmm, and the carbon atoms have z parameter of 0.388 with carbon–carbon bond distance of 1.34 A. The metal–carbon bonding is discussed. (auth)

8669

SPECTROPHOTOMETRIC DETERMINATION OF RUTHENIUM. Robert P. Larsen and Laurids E. Ross (Argonne National Lab., Lemont, Ill.). Anal. Chem. 31, 176-8(1959) Feb.

Conditions for the spectrophotometric determination of ruthenium as perruthenate have been established. Stable solutions of perruthenate are obtained only when the tetroxide is distilled into dilute sodium hydroxide (1M) containing hypochlorite. At higher hydroxide concentrations (6M) perruthenate is reduced rapidly by water to ruthenate even in the presence of hypochlorite. From 200 to 400 γ of ruthenium can be determined to an accuracy of +2% at the 95% confidence level. An improved procedure for the distillation of ruthenium tetroxide which is particularly rapid and clean uses a slurry of sodium bismuthate in dilute sulfuric acid as the oxidant. (auth)

8670

EXTRACTION AND FLAME SPECTROPHOTOMETRIC DETERMINATION OF LANTHANUM. Oscar Menis and T. C. Rains (Oak Ridge National Lab., Tenn.) and John A. Dean (Univ. of Tennessee, Knoxville). Anal. Chem. 31, 187-91(1959) Feb.

Microgram quantities of lanthanum are selectively extracted by a 0.1M solution of 2-thenoyltrifluoroacetone in 4-methyl-2-pentanone from a 1M acetate solution buffered at pH 5; lanthanum is then determined by a flame photometer. Of 18 elements tested, only titanium and aluminum interfere when they are present in greater amounts than the lanthanum; fluoride and phosphate interfere by preventing the extraction of lanthanum. When thorium, uranium, copper, and iron are major components of the sample, they are extracted with 2-thenoyltrifluoroacetone at pH 1.5 before extraction of lanthanum. The lanthanum emission emanates from a series of oxide bands; those at 442, 560, and 743 mμ were investigated. The band at 743 mμ is the most suitable for the determination of lanthanum in the presence of interfering elements and when a red-sensitive photomultiplier tube is incorporated in the flame photometer. The emission intensity of lanthanum from the ketone solution is 100-fold greater than the emissivity from aqueous solutions. The sensitivity is 0.05 γ of lanthanum per ml per scale division (% T). (auth)

8671

SPECTROPHOTOMETRIC DETERMINATION OF COBALT WITH 1-(2-PYRIDYLAZO)-2-NAPHTHOL. Gerald Goldstein, D. L. Manning, and Oscar Menis (Oak Ridge National Lab., Tenn.). Anal. Chem. 31, 192-5(1959) Feb.

A sensitive and selective spectrophotometric method for the determination of cobalt is based on the reaction of cobalt(III) with 1-(2-pyridylazo)-2-naphthol (PAN) at a pH of 3 to 6. A chelate is obtained which is extractable with chloroform, giving a solution which exhibits absorbance maxima at 590 and 640 mμ. Fewer interferences are encountered when the absorbance is measured at 640 mμ. Beer's law is obeyed over a range of 0.1 to 2.4 γ of cobalt per milliliter, with a coefficient of variation of about 3%. The cobalt is separated from thorium and most of the interfering elements such as iron, nickel, zinc, and cadmium by an anion exchange method. Of the elements which accompany the cobalt through the anion exchange column, only copper interferes; others either do not react with PAN or can be masked by the addition of citrate prior to reacting the cobalt with PAN. (auth)

8672

ULTRAVIOLET SPECTROPHOTOMETRIC DETERMINATION OF THORIUM WITH 2,4-DICHLOROPHENOXYACETIC ACID. Sachindra Kmar Datta (Darjeeling Government Coll., India). Anal. Chem. 31, 195-7(1959) Feb.

The thorium salt of 2,4-dichlorophenoxyacetic acid is soluble in an aqueous ammonium carbonate solution. The solution of this saltlike compound shows maximum absorbance at a wave length of 230 mμ and follows Beer's law. The spectrophotometric determination of thorium is based on the measurement of the absorbance of this solution. The sensitivity of the method is 0.019 γ of thorium per sq cm, but the accuracy is poor in samples containing less than 2 mg of thorium. The common metals do not interfere, but strong interference is exhibited by iron, cerium(IV), and zirconium. The optimum results are obtained in a concentration range between 2 and 14 mg of thorium per liter. (auth)

8673

GRAVIMETRIC DETERMINATION OF ZIRCONIUM IN TITANIUM. J. H. Hill and M. J. Miles (Titanium Metals Corp. of America, Henderson, Nev.). Anal. Chem. 31, 252-4(1959) Feb.

Mandelic acid is a rapid and accurate reagent for determining zirconium in titanium alloys without interference from many metals. Zirconium tetramandelate can be precipitated quantitatively from either hydrochloric or perchloric acid solutions. Iron, aluminum, vanadium, tin, copper, chromium, cobalt, magnesium, manganese, molybdenum, and nickel do not interfere when present in the amounts usually found in titanium alloys. Hafnium and niobium interfere, causing high results. (auth)

8674

DETERMINATION OF FLUORIDE BY CONDUCTOMETRIC TITRATION. H. Kubota and J. G. Surak (Oak Ridge National Lab., Tenn.). Anal. Chem. 31, 283-6(1959) Feb.

The reaction between fluoride and lanthanum ions is utilized for a volumetric semimicrodetermination of fluoride in which the end point is located by changes in the conductivity of the reaction medium. Milligram quantities of fluoride in solution can be determined with good accuracy and precision, if the total amount of extraneous ions is small. The titration is best applied to the analysis of distillates of the Willard-Winter sepa-

ration. Relative standard deviation of 0.15% has been obtained in titrating aliquots from a single distillation. A modified distillation apparatus which is simple to construct and permits rapid interchange of distilling flasks, makes possible separation of fluoride from a medium whose acid concentration is maintained high and nearly constant, to promote the efficiency of the distillation. A relative standard deviation of 1.8% for the distillation and titration was obtained from replicate determinations of 1-ml aliquots of a standard fluoride solution containing about 5 mg of fluoride. (auth)

8675

THE ANALYSIS OF ZIRCONIUM–THORIUM BINARY ALLOYS. G. W. C. Milner and J. W. Edwards (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Anal. Chim. Acta 20, 31-7(1959) Jan.

Thorium–zirconium binary alloys are analyzed by complexometric procedures. For alloys containing more than 20% thorium or 5% zirconium by weight, the sum of the constituents is obtained by a back titration procedure at pH 2.6 to 2.8 with bismuth nitrate using xylenol orange as indicator. Thorium is then masked with sulfate, and the liberated EDTA is titrated with bismuth at pH 1.2 to 1.3. For alloys containing less than 20% of thorium, thorium fluoride is precipitated on lanthanum fluoride to effect its separation before titration. For alloys containing less than 5% of zirconium, the zirconium is separated by precipitation with p-bromo-mandelic acid. (auth)

8676

SEPARATIONS INVOLVING SULPHIDES. VIII. SEPARATION OF RUTHENIUM AND INDIUM FROM ALKALINE EARTH METALS. G. B. S. Salaria (Univ. of Allahabad, India). Anal. Chim. Acta 20, 68-9(1959) Jan.

Procedures for separating Ru or In from alkaline earth metals using 2 N sodium sulfide reagent are presented. (auth)

8677

POLAROGRAPHIC REDUCTION OF HEXAVALENT URANIUM IN SODIUM TRIPOLYPHOSPHATE. I. GENERAL STUDIES. P. R. Subbaraman, N. R. Joshi, and J. Gupta (National Chemical Lab., Poona, India). Anal. Chim. Acta 20, 89-95(1959) Jan.

The behavior of some tripolyphosphate complexes at the dropping mercury electrode has been examined, in particular that of the uranyl tripolyphosphate complex. The uranyl ion in alkaline tripolyphosphate medium undergoes an irreversible one-electron reduction. Indifferent salts shift the $E^{1/2}$ to more positive potentials whereas maximum suppressors have an opposite effect. The wave obtained in presence of 0.01% camphor is well-defined and suitable for use in uranium analysis. (auth)

8678

THE DETERMINATION OF IODINE-131 IN URINE. J. E. Marriott (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Analyst 84, 33-7(1959) Jan.

Aliquots from 24-hour specimens are oxidized by heating under reflux with acid potassium permanganate, which also converts iodine present to iodate. The iodate is reduced by oxalic acid to iodine, which is distilled, extracted into carbon tetrachloride and then into water containing sulfur dioxide. Finally, the iodine is precipitated as silver iodide for counting. (auth)

8679

AN ION-EXCHANGE METHOD FOR THE SEPARATION OF THORIUM FROM RARE EARTHS, AND ITS APPLICATION TO MONAZITE ANALYSIS. R. A. Nagle and T. K. S. Murthy (Atomic Energy Establishment, Bombay). Analyst 84, 37-41(1959) Jan.

Thorium is adsorbed on a strongly basic anion-exchange resin, Amberlite IRA-400 (sulfate form), from a sulfate solution of pH about 2.0. Under these conditions, tervalent cerium and other rare earths are adsorbed to only a slight extent. An ion-exchange method has been developed for the separation of thorium from these elements. The method has also been applied to the determination of thorium and rare earths in monazite concentrates. (auth)

8680

THE VOLUMETRIC DETERMINATION OF CHLORIDE IN TITANIUM AND ZIRCONIUM BY A POLARISATION END-POINT PROCEDURE. D. Price and F. R. Coe (Imperial Chemical Industries, Ltd., Kynoch Works, Birmingham, Eng.). Analyst 84, 55-62(1959) Jan.

The development of an amperometric procedure is described. The recommended method is directly applicable to acid solutions containing either titanium or zirconium. It is simple, rapid and almost entirely free from personal bias. A modified form of the procedure has been successfully applied to the determination of silver in certain non-ferrous alloys; further work is in progress. (auth)

8681

NEW METHOD FOR THE PRODUCTION OF PURE URANIUM(IV) SULFATE. (To Deutsche Gold-u. Silber-Scheideanstalt, vorm. Roessler, Frankfurt am Main.) German Patent DAS 1032 238. Atompraxis 5, 42(1959). (In German)

The method consists in mixing uranium(IV) sulfate with elementary sulfur and heating the mixture for some time at 180 to 340°C, preferably from 250 to 300°C.

8682

NEW METHOD FOR THE SEPARATION OF NUCLEARLY PURE AMMONIUM URANATE. (To Deutsche Gold- u. Silber-Scheideanstalt vorm. Roessler, Frankfurt am Main.) German Patent DAS 1034 606. Atompraxis 5, 43(1959). (In German)

The method described for the separation of nuclear pure filterable ammonium uranate from water solution of uranium(VI) salts with ammonia consists in the introduction of gaseous ammonia diluted with inert gases into the solution.

8683

THE REACTION BETWEEN CESIUM AND CARBON DIOXIDE. Ralph Setton. Bull. soc. chim. France No. 11-12, 1400-4(1958) Nov.-Dec. (In French)

The reaction between cesium and carbon dioxide gives a product of the formula Cs_2CO_3, which appears to be "cesium cesioformate" or CsCOOCs. Its hydrolysis gives a molecule of cesium formate and one of hydroxide. Heated, the cesium cesioformate gives the oxalate $(CsCOO)_2$ and metallic cesium. (tr-auth)

8684

STRUCTURE OF THE COMPOUND $TiO_2 \cdot Al_2O_3$. COMPARISON WITH PSEUDOBROOKITE. Michelle Hamelin. Bull. soc. chim. France No. 11-12, 1559-66(1958) Nov.-Dec. (In French)

The structure of the compound $TiO_2 \cdot Al_2O_3$ was determined by the difference series. The coördinates obtained are approximately those indicated by Austin (Acta Cryst. 6, 812(1953)); a slight variation was established for the positions of the aluminum atoms and of one of the oxygens. The isomorphism between

this compound and pseudobrookite was verified by the comparative study of the two xoz projections. The differences between these two structures are found principally in the temperature coefficients which are identical for the different atoms of pseudobrookite ($B = 1.1 \times 10^{-15}$ cm^2) but which are distributed between 0.15 and 1.1×10^{-15} cm^2 according to the atoms for the compound $TiO_2 \cdot Al_2O_3$. (tr-auth)

8685

SPECTROPHOTOMETRIC DETERMINATION OF MICROGRAM QUANTITIES OF MOLYBDENUM IN URANIUM TRIOXIDE USING DITHIOL. Allan W. Ashbrook (Eldorado Mining & Refining Ltd., Ottawa). Chemist Analyst 48, No. 1, 5, 7(1959) Mar.

A spectrophotometric method for the determination of molybdenum in uranium trioxide is discussed. The procedure makes use of the yellow-green complex formed between molybdenum and dithiol (toluene-3,4-dithiol) in hydrochloric acid solution. This complex is extracted with carbon tetrachloride and is then measured spectrophotometrically. (J.H.M.)

8686

DETECTION OF BERYLLIUM WITH ACETYLACETONE. R. D. Cool (Madison Coll., Harrisonburg, Va.). Chemist Analyst 48, 7-8(1959) Mar.

A procedure for detecting beryllium has been developed by using beryllium in the form of analyzed sulfate or nitrate, and saturated aqueous acetylacetone solution prepared from redistilled acetylacetone. The limit of sensitivity, at which consistently positive tests were obtained, was 0.1 microgram of beryllium. A positive test was sometimes obtained with 0.05 microgram. The effects of foreign ions on the identification of beryllium were examined. (J.H.M.)

8687

DESIGN AND VARIOUS ASPECTS IN PLANNING RADIOISOTOPE LABORATORY. D. Vödrös. Energia es Atomtech. 11, 135-7(1958). (In Hungarian)

Descriptions are given of the practical design, floor plans, and various technical and safety aspects in the construction of radioisotope laboratory. The description includes laboratories for handling the upper, medium, and lower levels of radioactivity. The necessary remote-control equipment and decontamination and personnel protection measures as well as construction costs are included. (R.V.J.)

8688

PYROPROCESSING THORIUM FUELS. E. W. Murbach and W. N. Hansen (Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.). Ind. Eng. Chem. 51, 177-8(1959) Feb.

Decontamination of irradiated thorium fuels on a gram scale was investigated. The methods considered for scale-up operation were electrorefining and arc melting. It was concluded that electrorefining offers greater promise for high decontamination; however, arc melting would be easier to engineer. Both methods effectively remove the rare gases, cesium, strontium, and a fraction of the rare earths. Electrolysis removes the bulk of the refractory metals, while arc melting does not. (J.R.D.)

8689

OXIDATIVE EXTRACTION OF LANTHANIDE METALS FROM MOLTEN BISMUTH BY FUSED SALTS. William S. Ginell (Brookhaven National Lab., Upton, N. Y.). Ind. Eng. Chem. 51, 185-8(1959) Feb.

The equilibrium distribution of several fission product elements (lanthanide metals) between bismuth and the fused salt eutectic magnesium chloride-sodium chloride-potassium chloride was investigated. The experiments provided a basis for design of a countercurrent, salt-metal extraction process, and unpublished studies indicated that lanthanides may be separated from uranium in a single equilibrium contacting stage. (J.R.D.)

8690

PROPERTIES OF URANIUM DIOXIDE-SODIUM-POTASSIUM ALLOY SLURRY FUELS. B. M. Abraham, H. E. Flotow, and R. D. Carlson (Argonne National Lab., Lemont, Ill.) Ind. Eng. Chem. 51, 189-90(1959) Feb.

In an investigation of UO_2 suspended in NaK, a forced convection loop was constructed to determine the pressure drop vs. velocity curves at various temperatures. These pseudoconsistency curves were used to establish the effects of prolonged pumping, heating, and the addition of other metals. Interpretations of the results are given. (J.R.D.)

8691

QUANTITATIVE RECOVERY OF URANIUM HEXAFLUORIDE FROM A PROCESS GAS STREAM. S. H. Smiley, D. C. Brater, C. C. Littlefield, and J. H. Pashley (Union Carbide Nuclear Co., Oak Ridge, Tenn.). Ind. Eng. Chem. 51, 191-6(1959) Feb.

The physical properties of UF_6 are listed, and discussions of quantitative recovery methods are presented. Solid condensation of UF_6 by cold trapping is used in large- and small-scale operations because of equipment efficiency attained over a wide range of flows and concentrations; however, refrigeration requirements are relatively high, and no satisfactory continuous trapping process has been developed. Condensation of UF_6 to a liquid is attractive where moderate or large quantities must be removed from a stream containing small amounts of noncondensable gases. For streams containing high concentrations of noncondensable gases, absorption in an inert solvent such as C_8F_{18} and recovery by distillation are recommended. Sodium fluoride may be used to remove traces of UF_6 from a vent gas stream containing a low HF concentration. In fluorination vent gas streams containing 0.05 to 0.10% UF_6, this material can be scrubbed completely by the action of UF_4 in a fluidized bed reactor. Other methods of trapping and recovery are discussed briefly. (J.R.D.)

8692

KINETICS OF THE REACTION OF URANIUM TETRAFLUORIDE AND OXYGEN. Leslie M. Ferris (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 200-2(1959) Feb.

Reaction rates of UF_4 with dry O_2 were determined at 550 to 815°C by a thermogravimetric technique. The reaction is first order with respect to the UF_4 surface area, being dependent also on O_2 partial pressure. The experimental procedure is given as well as a description of the apparatus and methods of rate constants determination. (J.R.D.)

8693

URANIUM HEXAFLUORIDE GASEOUS DIFFUSION CASCADE INVENTORY CONTROL. G. P. Rutledge and A. H. Wernecke (Goodyear Atomic Corp., Portsmouth, Ohio). Ind. Eng. Chem. 51, 203-4(1959) Feb.

Equipment for determination of uranium-235 in a

UF_6 diffusion cascade by utilizing operating vs. static pressure relationships was evaluated. One set of pressure-temperature data was collected during cell recycle operation, and a second set was collected after the compressors were stopped, giving a comparison of static pressures and temperatures. Measurements were made until no further change was evident. A straight-line relationship between average recycle pressure and static conditions exists. (J.R.D.)

8694

RADIATION-INDUCED REACTION OF HYDROCARBONS WITH n-BUTYL MERCAPTAN. T. D. Nevitt, W. A. Wilson, and H. S. Seelig (Standard Oil Co., Whiting, Ind.). Ind. Eng. Chem. 51, 311-12(1959) Mar.

Heptane, methylcyclohexane, 1-octene, 2-octene, and benzene, each containing varying amounts of n-butyl mercaptan, were subjected to gamma radiation. The mercaptan was converted to sulfides and disulfides by hydrocarbon free radicals formed by the absorbed radiation. With the paraffins and aromatics, the amount of mercaptan reacting depends only on the amount of energy absorbed. With the olefins, the amount of reaction depends also on the mercaptan concentrations. Reaction is inhibited by aromatics and promoted by olefins. The effectiveness of radiation in such an application as sweetening of petroleum therefore depends heavily on aromatic and olefin contents. (auth)

8695

ADSORPTION. B. L. Harris (Chemical Warfare Labs., Army Chemical Center, Md.). Ind. Eng. Chem. 51, 340-3(1959) Mar.

Research and industrial developments in adsorption are reviewed. The material is classified as: gas chromatography, liquid-phase studies, preparation of adsorbents, and miscellaneous, including porosity effects, surface area measurement, theory, energy considerations, and apparatus. 193 references. (T.R.H.)

8696

ION EXCHANGE. Robert Kunin and George W. Bodamer (Rohm & Haas Co., Philadelphia). Ind. Eng. Chem. 51, 373-7(1959) Mar.

A review of developments in ion exchange is presented. It is divided into sections on: theory, water conditioning, inorganic chemistry, organic and biochemistry, food technology, waste treatment, catalysis, membrane processes, new ion exchange materials, and liquid exchangers. 203 references. (T.R.H.)

8697

LIQUID EXTRACTION. Robert E. Treybal (New York Univ.). Ind. Eng. Chem. 51, 378-88(1959) Mar.

A literature review on liquid extraction is presented. The area reviewed includes: equilibria, calculation methods, equipment (spray towers, packed towers, rotating-disk towers, Oldshue-Rushton columns, pulsed perforated-plate columns, mixer-settlers, centrifugal separators, drops, and mass-transfer phenomena), and process applications (petroleum, coke-oven by-products, fats and oils, pharmaceuticals, and metals). 353 references. (T.R.H.)

8698

EFFECTS OF pH SOLUTIONS ON URANYL LUMINESCENCE SPECTRA. L. T. Kantardzhyan. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 23, 131-4(1959). (In Russian)

The effects of pH on the shape of the uranyl luminescence spectrum were studied in boric beads activated by uranyl ions and in alcohol, glycerin, and aqueous uranyl solutions with various pH's. (R.V.J.)

8699

CHEMISTRY OF RHENIUM AND TECHNETIUM. II. MAGNETIC SUSCEPTIBILITIES OF $ReCl_5$, $ReCl_3$, $TcCl_4$, AND $MoCl_5$. Derro Knox and Charles Eugene Coffey (Univ. of North Carolina, Chapel Hill). J. Am. Chem. Soc. 81, 5-7(1959) Jan. 5.

The magnetic susceptibilities of $ReCl_5$, $ReCl_3$, $TcCl_4$, and $MoCl_5$ have been measured by the Gouy technique from liquid nitrogen at room temperature. The pentachlorides follow the Curie–Weiss relationship with these constants: $ReCl_5$, $\mu_{eff} = 2.21$, $\Delta = 164°$; $MoCl_5$, $\mu_{eff} = 1.52$, $\Delta = -23°$. The $1/\chi$ vs T plots for $ReCl_3$ and $TcCl_4$ are not straight lines. Exchange interaction between the magnetic moments probably is significant for all of these compounds. (auth)

8700

HEATS OF DILUTION AND RELATED THERMODYNAMIC PROPERTIES OF AQUEOUS RARE EARTH SALT SOLUTIONS AT 25°; INTEGRAL HEATS OF SOLUTION OF $NdCl_3 \cdot 6H_2O$. F. H. Spedding, A. W. Naumann, and R. E. Eberts (Iowa State Coll., Ames). J. Am. Chem. Soc. 81, 23-8(1959).

The heats of dilution at 25° of $LaCl_3$, $NdCl_3$, $ErCl_3$, $YbCl_3$, $La(NO_3)_3$, and $Yb(NO_3)_3$ solutions have been measured for concentrations up to about 0.2 molal. Relative apparent molal heat contents of the solute, ϕ_L, have been calculated for the solutions used and empirical expressions have been derived for the concentration dependence of ϕ_L. The integral heats of solution of $NdCl_3 \cdot 6H_2O$ have been measured and the relative apparent molal heat content of $NdCl_3$ derived from these quantities. The results are compared to theoretical predictions and to previous measurements. A tentative explanation has been given for the anomalous behavior of the erbium and ytterbium salts at very low concentrations. (auth)

8701

A SPECTROPHOTOMETRIC INVESTIGATION OF VANADIUM(V) SPECIES IN ACIDIC SOLUTIONS. Leonard Newman and Kenneth P. Quinlan (National Lead Co., Inc., Upton, N. Y.). J. Am. Chem. Soc. 81, 547-9(1959) Feb. 5.

By utilizing a spectrophotometric approach, the hydrolysis reaction for the pervanadyl ion $10VO_2^+ + 8H_2O = H_2V_{10}O_{28}^{4-} + 14H^+$ postulated in the literature has been examined. At 25° and at an ionic strength of 3.0, the logarithm of the hydrolysis constant was found to be -5.8 ± 0.18. This constant is in good agreement with that reported by Rossotti and Rossotti. The extension in the range of the vanadium concentration over which this reaction has been studied further supports this mechanism. (auth)

8702

TECHNETIUM AND PROMETHIUM. G. E. Boyd (Oak Ridge National Lab., Tenn.). J. Chem. Educ. 36, 3-14 (1959) Jan.

A review of the history of Tc and Pm is presented. The discovery of Tc was a direct consequence of the invention of the cyclotron in which Mo was transmuted to Tc by bombardment with energetic protons. The beginning of the knowledge of this element based on laboratory experiment is regarded as being about 1937. In 1941 several new activities which were presumed to be those of element 61 were produced by irradiating Nd and Pr with neutrons, deuterons, and alpha particles. Chemical identification of Pm was supplied in 1945. The nuclear chemistry of these elements is

summarized along with methods of preparation. The chemistry of Tc and its compounds is considered, followed by an examination of some chemical aspects of Pm. Finally, applications of fission-product Tc and Pm are discussed. (J.R.D.)

8703

ASTATINE AND FRANCIUM. Earl K. Hyde (Univ. of California, Berkeley). J. Chem. Educ. 36, 15-21(1959) Jan.

A discussion of At and Fr is presented with emphasis on their instability, chemical properties in relation to position in the periodic chart, and the form in which they may be found in nature. It is pointed out that elements 85 and 87 are found in nature only in uranium minerals as short-lived isotopes in the decay chains of Th^{232}, U^{235}, and U^{238}. An idealized sketch of the mass-energy surface for elements in the heavy element region is presented which illustrates the reason for the short half lives of elements 85 and 87. The nuclear properties of these elements are discussed and tabulated. Finally, the chemical properties of both elements are examined. (J.R.D.)

8704

A METHOD OF ADJUSTING pH WITHOUT INTRODUCING EXTRANEOUS CATIONS OR ANIONS. J. E. Powell and M. A. Hiller (Iowa State Coll., Ames). J. Inorg. & Nuclear Chem. 9, 100(1959).

Hydroxyl ions were effectively added to a Sc_2O_3 in water solution without adding cations. Hydroxyl-form anion resin beads were used. The procedure should work well with salts which hydrolyze at the equivalence point as long as the anion resin has a stronger affinity for the salt's anion than it does for hydroxyl ions. (T.R.H.)

8705

PHYSICAL DAMAGE BROUGHT ABOUT BY THERMALLY CYCLING URANIUM THROUGH ITS PHASE CHANGES. S. N. Buckley, A. G. Harding, and M. B. Waldron (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inst. Metals 87, 150-4(1959) Jan.

Physical damage induced by thermally cycling uranium through its phase changes is shown to be caused by macrotransformation stresses and the different mechanical strengths of the polymorphs. The influence of prior history and thermal conditions during testing on the rate of progress of damage is reported. (auth)

8706

ON THE SEPARATION OF RARE EARTH ELEMENTS. VI. FURTHER STUDY OF RARE EARTH ELEMENT SEPARATION BY COMPLEX ELUTION. METHOD OF RAPID LANTHANUM SEPARATION. Wolf, Leopold, Massonne, and Joachim. J. prakt. Chem. 5, No. 5-6, 288-90(1958). (Translated from Referat. Zhur. Khim. No. 22, 1958, Abstract No. 73509.)

Lanthanum was separated from a mixture of rare earth elements by ion exchange. All the rare earths, with the exception of lanthanum, were eluted from the resin with a 4% solution of β-oxyethyliminodiacetic acid at pH 5 and a temperature of 70°C. The lanthanum was then eluted with a 4% nitryltriacetic acid solution containing 2% NH_4Cl and HN_4OH. Pure lanthanum was obtained with a yield of 95%. The method was used for lanthanum separation in a pilot plant installation. (J.S.R.)

8707

QUANTITATIVE SPECTROGRAPHIC ANALYSIS OF THE RARE EARTH ELEMENTS. X. DETERMINATION OF RARE EARTH IMPURITIES COMMONLY ASSOCIATED WITH PURIFIED THULIUM, YTTERBIUM, LUTETIUM AND SCANDIUM. R. N. Kniseley, V. A. Fassel, R. W. Tabeling, B. G. Hurd, and B. B. Quinney (Iowa State Coll., Ames). Spectrochim. Acta 13, 300-3(1959) Jan.

Emission-spectrometric methods are described for the following quantitative determinations: yttrium, holmium, erbium, ytterbium, and lutetium in thulium; samarium, yttrium, erbium, thulium, lutetium, and scandium in ytterbium; yttrium, thulium, ytterbium, and lutetium in scandium. The basic method involves the d-c carbon arc excitation of rare earth oxide-graphite mixtures. In all cases the percent deviation from the mean is less than ±5 % (auth)

8708

REVISION OF THE POLAROGRAPHIC METHODS FOR THE DETERMINATION OF CATIONS. I. TITANIUM. II. NIOBIUM AND TANTALUM. III. ZIRCONIUM. IV. GERMANIUM. Maria Teresa Aguas da Silva. Técnica (Lisbon) 31p. (1955) Feb.-Mar. (In French)

An attempt was made to determine polarographically titanium, niobium, and tantalum where all these cations are present. The calibration curves for titanium determination were established when niobium and tantalum were present. However by this method niobium and tantalum separation was not possible. Calibration curves were plotted for niobium and tantalum solutions where either one of these cations is present. In addition, a study on the polarographic behavior of zirconium and germanium is presented for determination purposes. Zirconium determinations were performed in non-aqueons medium (methanol) from 0.04 μg up to 1 mg ZrO_2. The use of EDTA 0.1 M as supporting electrolyte makes possible the determination of 8 μg to 1 mg of germanium. (auth)

8709

PROGRESS IN NUCLEAR ENERGY. SERIES III. PROCESS CHEMISTRY. VOLUME 2. F. R. Bruce, J. M. Fletcher, and H. H. Hyman, eds. New York, Pergamon Press, 1958. 586p. $17.50.

Forty-five papers on process chemistry are presented. Separate abstracts have been prepared for each paper. (W.L.H.)

8710

THE RECOVERY OF URANIUM FROM LEACH LIQUORS BY ELECTROLYTIC PERMSELECTIVE MEMBRANE PROCESSES. Robert Kunin (Rohm & Haas Co., Philadelphia). pp. 35-44 "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The techniques of using electrolytic permselective membranes are described. These techniques are combined with electrolytic reduction of uranyl ion and applied to the preparation of solid uranium concentrates from leach liquors encountered in uranium extraction operations. By electrolytic migration through an anion-permeable membrane the pH of an acidic uranium solution may be raised while the uranyl ion is reduced to uranium(IV) at the cathode. A readily filtrable precipitate of hydrated uranium dioxide or uranium(IV) phosphate is produced and the acid recovered in a form suitable for additional leaching operations. An alkaline carbonate leaching process can be combined with electrolytic precipitation of the uranium concentrate and reagent recovery, by use of a cation-permeable membrane. (auth)

8711
LEACHING OF URANIUM FROM PHOSPHATE ROCK. E. Foa, G. Pery, J. Trocker, Z. Hadari, and I. Alter (Israel Atomic Energy Commission). pp. 45-54 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Uranium is present in phosphate rock in economically recoverable quantities. The only practical recovery methods known involve solvent extraction from either phosphoric acid or a solution or slurry prepared during the production of phosphate fertilizer material. This first section reviews the chemistry of attempts, primarily in the U. S., to integrate extraction with fertilizer production. (auth)

8712
RECOVERY OF THORIUM FROM MONAZITE. Howard E. Kremers (American Potash & Chemical Corp., West Chicago, Ill.). pp. 56-60 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Thorium may be recovered from monazite in forms suitable for further purification by either the classical sulfuric acid or the caustic methods. Each method has its inherent advantages and disadvantages. (auth)

8713
THE REFINING OF THORIUM BY SOLVENT EXTRACTION. A. E. Bearse, D. D. Foley, and R. B. Filbert, Jr. (Battelle Memorial Inst., Columbus, Ohio). pp. 61-7 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Thorium nitrate of very high purity can be obtained satisfactorily by a solvent-extraction process with tributyl phosphate in a hydrocarbon diluent as the extractant. Nitric acid is an effective salting agent. Factors influencing the extraction are discussed. A mixer–settler pilot plant has been used to demonstrate the feasibility of carrying out the process on a larger scale. (auth)

8714
PRODUCTION OF THORIUM NITRATE FROM URANOTHORIANITE ORES. M. Brodsky, R. Sartorius, and Y. Sousselier. pp. 68-76 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The separation of thorium and uranium from uranothorianite ores, either by precipitation or solvent-extraction methods, are discussed, and an industrial process for the manufacture of thorium nitrate is described. (auth)

8715
THE RECOVERY OF THORIUM-230. D. J. Carswell and J. M. Fletcher (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 80-5 in "Progess in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Thorium-230, which occurs as the most abundant daughter in the uranium decay series, is a valuable tracer for use in radiochemical studies. Methods for its isolation from uranium ore process wastes are discussed. (auth)

8716
THE EXTRACTION OF PROTACTINIUM FROM REFINERY RESIDUES. A. G. Goble, J. Golden, A. G. Maddock, and D. J. Toms (The Chemical Labs., Cambridge, Eng.). pp. 86-98 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A survey of the distribution of protactinium in the earlier stages of the Springfields uranium refinery is reported and a process for the separation of protactinium from one of the residues is described. Previous methods for the extraction of protactinium are reviewed. (auth)

8717
ACTINIUM PROCESSING. F. Hagemann (Argonne National Lab., Lemont, Ill.). pp. 99-100 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Actinium may be recovered from natural sources as a minor constituent in a rare-earth fraction and separated by the techniques developed for rare-earth separations. Milligram amounts of pure actinium compounds have been prepared by neutron bombardment of radium and separated and purified by a TTA solvent-extraction process or a cation resin exchange process. (auth)

8718
THE RECOVERY OF RADIUM AND PROTACTINIUM AS BY-PRODUCTS IN THE TREATMENT OF URANOTHORIANITE ORES. G. Bouissieres, R. Sartorius, and Y. Sousselier (Commissariat a l'Energie Atomique, Paris). pp. 101-5 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The high uranium + thorium content of uranothorianite ores makes them particularly attractive for the recovery of the long-life radioactive decay by-products i.e., radium-226 + mesothorium-1 (radium-228), protactinium-231 and actinium-227. Possible methods, which can be used in conjunction with the extraction of uranium and thorium, for the recovery of radium and protactinium are discussed. (auth)

8719
CONVERSION OF URANIUM TRIOXIDE TO URANIUM TETRAFLUORIDE. S. H. Smiley and D. C. Brater (Oak Ridge Gaseous Diffusion Plant, Tenn.). pp. 107-21 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A two-step uranium tetrafluoride preparation method involving the reduction of uranium trioxide with hydrogen and treatment of the resulting uranium dioxide with anhydrous hydrogen fluoride is described. Various types of reactors, including the ribbon flight screw, the vibrating tray, the moving pellet bed and the fluid-bed, are evaluated with respect to processing capacity and product quality. In addition, the effects of uranium trioxide properties and process conditions on reaction rates are discussed. (auth)

8720
DEVELOPMENT OF A FLUIDIZED-BED PROCESS FOR THE PRODUCTION OF URANIUM TETRAFLUORIDE. A. A. Jonke and N. M. Levitz (Argonne National Lab., Lemont, Ill.). pp. 122-35 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Experimental work has been carried out to demonstrate the technical feasibility of applying the fluidization technique to the production of uranium tetrafluoride. The results of development studies in equipment ranging in size from bench scale to production scale are described, and the advantages of the fluidized-bed technique over conventional processing methods are pointed out. Development work on the production of uranium trioxide and uranium dioxide, as well as uranium tetrafluoride, is included. The employment of multistage fluidized-bed reactors is described and compared with single-stage reactors. (auth)

8721

PREPARATION OF URANIUM HEXAFLUORIDE. D. C. Brater and S. H. Smiley (Oak Ridge Gaseous Diffusion Plant, Tenn.). pp. 136-48 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A continuous process for the preparation of uranium hexafluoride involving the instantaneous reaction of finely divided uranium tetrafluoride or uranium oxides with elemental fluorine is discussed. Well dispersed solids and fluorine are charged into a vertical pipe reactor, and essentially complete consumption of either material can be realized if a stoichiometric excess of the other reactant is employed. With a deficiency of gas, however, rigorous control of the reactor wall temperature is required, and a specially designed scraped cooler in the reactor outlet prevents the formation of fused uranium fluorides. Methods for the selective removal and complete recovery of uranium hexafluoride from a gas stream are presented. An electrolytic process for the generation of fluorine is also described. (auth)

8722

THE PREPARATION OF THORIUM OXIDE AND THORIUM FLUORIDE FROM THORIUM NITRATE. Ray W. Fisher (Iowa State Coll., Ames). pp. 149-54 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Methods are reviewed for converting thorium nitrate to purified thorium fluoride. The nitrate is converted to an oxalate by precipitation from an aqueous acid solution. The oxalate is ignited to thorium oxide and the oxide reacted with anhydrous hydrogen fluoride to yield the fluoride. Specific process conditions are given for each step. Alternative less-favored methods are also discussed. (auth)

8723

REDUCTION OF THORIUM CHLORIDE TO METAL BY ALKALI METAL AMALGAMS. O. C. Dean (Oak Ridge National Lab., Tenn.). pp. 155-70 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A new semi-continuous, low-temperature process for producing thorium metal is described. Thorium tetrachloride is reduced with sodium amalgam to thorium metal which forms a quasi amalgam. Unreacted sodium and thorium tetrachloride are removed from the amalgam by washing with hydrochloric acid. The thorium is concentrated in the amalgam by filtration, mercury is removed in a vacuum retort and, finally, the thorium is arc melted. Laboratory studies indicate that the process will produce reactor-grade metal at a cost substantially less than the conventional process employing calcium reduction of thorium tetrafluoride. (auth)

8724

CONVERSION OF URANIUM HEXAFLUORIDE TO URANIUM TETRAFLUORIDE. S. H. Smiley and D. C. Brater (Oak Ridge Gaseous Diffusion Plant, Tenn.). pp. 171-83 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The development of a single-step continuous process for the quantitative reduction of uranium hexafluoride to uranium tetrafluoride is described. A dense pure uranium tetrafluoride is prepared when gaseous uranium hexafluoride and hydrogen react in a vertical pipe reactor, and a usable by-product, anhydrous fluoride, is formed. The heat required to initiate and sustain the reduction can be supplied either by the reactor walls or by the highly exothermic reaction of hydrogen with a small amount of elemental fluorine which is added to the uranium hexafluoride stream. Studies with trichloroethylene as the reductant are also discussed. Although the conversion of the uranium hexafluoride to uranium tetrafluoride is complete, the solid product is low in density and is highly contaminated by the organic by-products of the reaction unless the uranium hexafluoride feed is highly diluted with nitrogen. (auth)

8725

CONVERSION CHEMISTRY OF PLUTONIUM NITRATE. K. M. Harmon and W. H. Reas (Hanford Atomic Products Operation, Richland, Wash.). pp. 184-93 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Methods are described for the precipitation of plutonium compounds from aqueous nitrate solutions, the conversion of these compounds to a dry plutonium halide and the bomb reduction of a plutonium fluoride to metal with metallic calcium using iodine as a booster. (auth)

8726

THE SEPARATION OF ZIRCONIUM AND HAFNIUM. J. M. Googin (Union Carbide Nuclear Co., Oak Ridge, Tenn.). pp. 194-209 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Three processes for the separation of zirconium and hafnium have been operated on a large scale: fractional crystallization of the ammonium and potassium fluorides; preferential solvent extraction of the hafnium thiocyanate complex with isobutyl methyl ketone; and preferential extraction of zirconium from nitrate solution with tributyl phosphate. The processes are reviewed and compared, with particular emphasis on the extraction of the thiocyanates with isobutyl methyl ketone. (auth)

8727

FACTORS AFFECTING FUEL CYCLE COST. J. W. Ullmann (Oak Ridge National Lab., Tenn.). pp. 210-21 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The components of over-all fuel cost are analyzed, and the effects of several parameters are discussed. (auth)

8728

PREPARATION OF POWER REACTOR FUELS FOR PROCESSING BY SOLVENT EXTRACTION. R. E. Blanco (Oak Ridge National Lab., Tenn.). pp. 223-46 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Power reactor reprocessing problems are discussed from the viewpoint of converting heterogeneous fuels to a nitric acid solution suitable for purification by solvent extraction. Current and proposed fuels are classified into types based on reprocessing principles. Flowsheets are presented for the solution of aluminum-clad uranium or thorium fuels in nitric acid along with procedures under development for processing zirconium and stainless steel clad fuels. Methods under development include mechanical processing, solution in sulfuric, hydrofluoric or dilute hydrochloric–nitric acids, hydrochlorination, electrolytic solution, oxidation and carburization. (auth)

8729

THE REMOVAL OF RADIOACTIVE ZIRCONIUM AND RUTHENIUM FROM PROCESS SOLUTIONS: PERMANGANATE PRE-TREATMENT. Roy C. Feber (Knolls Atomic Power Lab., Schenectady, N. Y.). pp. 247-56

in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A survey is made of methods of decontamination of process feeds from fission products. Procedures with permanganate for the removal of at least 90 to 95% of fission product zirconium, niobium, ruthenium, and iodine from process feeds are discussed. (auth)

8730

OPERATION OF THE THOREX PILOT PLANT WITH HIGHLY IRRADIATED THORIUM. E. M. Shank (Oak Ridge National Lab., Tenn.). pp. 279-301 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The Thorex solvent-extraction flowsheet was converted from a one-cycle to a multi-cycle system to increase the product decontamination when processing highly irradiated thorium. The new "co-decontamination" flowsheet provides two solvent-extraction cycles for thorium and three such cycles plus an ion-exchange step for uranium. The Thorex Pilot Plant is mostly installed in concrete-shielded cells. It is directly maintained and remotely operated. Process equipment is unit-shielded, provisions for equipment decontamination are built in, radiochemical sampling equipment is remotely operated, and concatenated pulsed columns are used for the extraction. The plant has been in operation for 3 years, including 17 months with the co-decontamination flowsheet. The thorium and uranium products from thorium irradiated to 4000 g of uranium-233 per ton and decayed 400 days met radioactivity specifications. Products from material decayed 30 days contained somewhat more fission products than specifications for direct refabrication to metal fuel permit. Ionic contaminants in all products were sufficiently low for satisfactory subsequent processing. Solvent-extraction losses were higher than desired. Equipment performance was generally satisfactory. (auth)

8731

PLUTONIUM RECOVERY BY A REFLUX SOLVENT-EXTRACTION SYSTEM. Burton F. Judson (Hanford Atomic Products Operation, Richland, Wash.). pp. 302-6 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Plutonium may be purified and concentrated by a product-reflux solvent-extraction system. A process involving tributyl phosphate in carbon tetrachloride has been developed and tested on the semi-works scale. The advantages and disadvantages of employing product-refluxing are discussed with respect to attainable concentration, product purity, inventory and ease of plant design and operations. (auth)

8732

THE DECOMPOSITION REACTIONS OF TRIBUTYL PHOSPHATE AND ITS DILUENTS AND THEIR EFFECT ON URANIUM RECOVERY PROCESSES. L. L. Burger (General Electric Co., Richland, Wash.). pp. 307-19 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The properties of tributyl phosphate and its common contaminants are discussed. Tributyl phosphate decomposition occurs mainly by hydrolysis. Rate constants for the reaction are given as a function of temperature and phase composition. Impurities which are important from a process standpoint may also be introduced by radiation-induced decomposition of tributyl phosphate and by chemical and radiation decomposition of the diluents that are usually employed with it. (auth)

8733

RADIATION EFFECTS IN SOLVENT EXTRACTION PROCESSES. T. Rigg (United Kingdom Atomic Energy Authority, Windscale, Cumb., Eng.) and W. Wild (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 320-31 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The yields of gaseous products from the irradiation of solvents are given together with the yields of acid phosphates from the irradiation of tributyl and other trialkyl phosphates. For tributyl phosphate, the influence on these products of dilution with kerosene, water, nitric acid, and uranyl nitrate are described and results on the retention of plutonium, uranium, and fission products, applicable to extraction processes are given. (auth)

8734

LABORATORY MIXER-SETTLERS. W. D. Jamrack (United Kingdom Atomic Energy Authority, Springfields, Eng.); D. H. Logsdail (Atomic Energy Research Establishment, Harwell, Berks, Eng.); and G. D. C. Short (United Kingdom Atomic Energy Authority, Windscale, Cumb., Eng.). pp. 332-54 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The place of the laboratory mixer-settler in obtaining data for the chemical processing of nuclear materials is described. The development of laboratory mixer-settler equipment is traced from simple equilibrating tubes to remotely controlled mechanical mixer-settlers for continuous operation. Different types of mixer-settler are described in detail, their operating and design characteristics discussed and their advantages and disadvantages enumerated. (auth)

8735

ION-EXCHANGE DATA FOR THE ACTINIDE ELEMENTS IN NITRIC AND HYDROCHLORIC ACID SOLUTIONS. C. J. Hardy (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 357-62 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Ion-exchange data for the actinide elements in nitric and hydrochloric acid solutions are summarized. The selection of resin and operating conditions for the separation and purification of actinide elements and the structure of species in solution are discussed. (auth)

8736

THE CONCENTRATION AND PURIFICATION OF URANIUM AND PLUTONIUM BY ION EXCHANGE. F. R. Bruce (Oak Ridge National Lab., Tenn.). pp. 363-76 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Cation exchange may be used to concentrate the dilute uranium-233 or plutonium products which are obtained from solvent-extraction processes. Losses of fissionable material are less than 0.01%, and some separation of the products from fission and corrosion products is achieved. (auth)

8737

THE PURIFICATION AND CONCENTRATION OF SOLUTIONS OF PLUTONIUM BY ION EXCHANGE. I. Prevot and P. Regnaut (Commissariat a l'Energie Atomique, Paris). pp. 377-85 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Laboratory investigations with cation- and anion-exchange resins for the final purification of plutonium from traces of uranium, iron, and fission-product zirconium are described. On the basis of these results the

plutonium stream in nitric acid solution from a solvent-extraction cycle is adsorbed on a cation resin as plutonium(III) and eluted with hydrochloric acid; iron and uranium are removed by passage of this solution through an anion column and further purification of plutonium is achieved by its adsorption as plutonium(IV) on a second anion column. (auth)

8738

URANIUM PURIFICATION BY URANYL AMMONIUM PHOSPHATE PRECIPITATION. D. M. Lang (Oak Ridge Gaseous Diffusion Plant, Tenn.). pp. 387-95 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A process for the recovery and purification of uranium by precipitation as uranyl ammonium phosphate is described. The precipitation is carried out at a pH between 0.5 and 2 by the addition of alkali to a strongly acidic solution containing uranyl, phosphate and ammonium ions, or it may also be made by the addition of ammonium ion at a pH between 0.5 and 2 to a solution containing uranyl and phosphate ions. The process is most applicable when it is desirable to precipitate either from an acidic solution or from a solution containing the phosphate ion. The procedure has been tested on pilot-plant scale for the recovery and decontamination of uranium from stored bismuth phosphate process waste and for the recovery of uranium from uranium–magnesium fluoride slag. (auth)

8739

FUEL PROCESSING BY ELECTROREFINING. Leonard W. Niedrach (Knolls Atomic Power Lab., Schenectady, N. Y.). pp. 396-411 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The current status of electrorefining as a method for processing reactor fuels is reviewed. An indication is given of the type of fuels for which such a process would be most adaptable. Both high-temperature processes producing molten products and lower temperature processes producing solid products are discussed. The effects of important processing variables are examined and decontamination data from laboratory work are given. (auth)

8740

MERCURY PROCESSING OF URANIUM AND ITS ALLOYS. O. C. Dean (Oak Ridge National Lab., Tenn.). pp. 412-19 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

A process for the removal of impurities from natural and irradiated uranium by solution in and recovery from mercury is described. Solution rates and solubilities of uranium in mercury and amalgams were determined. The extent of purification of natural uranium and decontamination factors for the higher-yield fission products were evaluated. (auth)

8741

THE FIXATION OF HIGHLY ACTIVE WASTES IN SOLID FORM. C. B. Amphlett (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 422-42 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

In an attempt to overcome inherent difficulties which may arise in the long-term storage of concentrated waste solutions of high specific activity, several alternative processes of storage have been proposed in which the waste solutions are first converted to a solid form. The type of storage required for the latter depends upon the resistance of the product to leaching by ground water or other agencies; from this viewpoint the best method is to convert the wastes to a glass or ceramic, although this achieves a smaller volume reduction than methods based on direct conversion to oxides. The different methods of converting waste solutions to solid form are reviewed and a critical comparison of the available data is attempted. (auth)

8742

PROCESSING AND DISPOSAL OF LOW-LEVEL WASTES. D. C. Sammon (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 443-55 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Problems associated with the disposal of low-level radioactive wastes to ground, sea, or river are described. After outlining various methods for the removal of radio-isotopes by co-precipitation or adsorption it is shown how some of these methods may be combined into a single process. Decontamination by means of ion-exchange resins is also considered. (auth)

8743

WASTE PROCESSING: WINDSCALE PHILOSOPHY AND ARRANGEMENTS. K. Saddington (United Kingdom Atomic Energy Authority, Windscale, Cumb., Eng.). pp. 456-69 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The original philosophy determining the nature and the methods of treatment of the various streams of radioactive liquid effluent at the Windscale Works is outlined. Detailed descriptions of the chosen treatments are given, together with a review of operating experience. The disposal to sea of low activity effluent is discussed in terms of the investigational work performed to determine the safe limits of discharge and of several years experience in this method of disposal to a natural environment. (auth)

8744

ULTIMATE DISPOSAL OF RADIOACTIVE WASTES. W. A. Rodger and P. Fineman (Argonne National Lab., Lemont, Ill.). pp. 470-85 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The general problem of processing radioactive wastes is discussed. The question of dispersal is examined and rejected as a method of disposal. The problem of concentrating the radioactive species and storing them is then investigated in more detail. Disposal in pits, wells, tanks, mines, and in salt domes either in the form of solutions or fixed on solids are all considered. A preliminary evaluation suggests that the fixation of these wastes as solids and their storage in underground areas, such as mined salt domes, appears to represent the maximum of safety: economic considerations are not well established, but do not seem to be prohibitive. (auth)

8745

THE PRODUCTION OF KILOCURIE SOURCES OF CAESIUM-137. B. F. Warner (United Kingdom Atomic Energy Authority, Windscale, Cumb., Eng.). pp. 487-500 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The process and pilot plant used by the U.K.A.E.A. for the isolation of kilocurie quantities of cesium-137 from the fission-product wastes at Windscale Works is described. The selected process precipitates the cesium as the tungstophosphate which, after washing, is dissolved in ammonia; the phosphate and tungstate ions

are removed by an anion-exchange resin, leaving cesium and ammonium hydroxides in solution. After removal of the latter by evaporation, the cesium is converted to the sulfate, the solution evaporated to dryness and the sulfate cast at 100°C into a platinum capsule. (auth)

8746
THE DEVELOPMENT OF RECOVERY PROCESSES FOR NEPTUNIUM-237. J. R. Flanary and G. W. Parker (Oak Ridge National Lab., Tenn.). pp. 501-17 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Gram quantities of neptunium-237 were recovered from irradiated natural uranium, irradiated enriched uranium and fluorination ash from depleted uranium by extraction with tributyl phosphate. The flowsheet from natural uranium is a modified Purex flowsheet, with simultaneous extraction of plutonium, uranium, and neptunium(VI) and partitioning by acidity adjustment. Final concentration and purification are by ion exchange. For enriched uranium the Neptex process, which is similar to the 25-TBP process, is used. There is no plutonium present and neptunium is extracted in the tetravalent state. The process used with fluorination ash is similar to the Neptex second cycle. (auth)

8747
THE RECOVERY OF NEPTUNIUM-237. J. S. Nairn and D. A. Collins (United Kingdom Atomic Energy Authority, Windscale, Cumb., Eng.). pp. 518-33 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Neptunium-237 has been recovered in gram quantities from large volumes of waste solution containing this element in an extremely low concentration. Both solvent extraction and anion-exchange processes for recovery were examined. The process selected involved concentration with an anion-exchange resin. The concentrated eluate was purified by a solvent cycle in which the neptunium, as neptunium(IV), was extracted into thenoyltrifluoroacetone–benzene. A final anion-exchange stage removed the last traces of added reagents and provided a solution of neptunium nitrate. (auth)

8748
PHYSICAL PROPERTIES OF THE URANYL NITRATE, ALUMINIUM NITRATE, NITRIC ACID AND WATER SYSTEM. C. M. Slansky (Phillips Petroleum Co., Idaho Falls, Idaho). pp. 535-43 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Physical properties are summarized for aqueous and organic solutions pertinent to several major solvent-extraction recovery systems for nuclear fuel. The data include freezing points, densities, viscosity, pH, mutual solubilities, boiling points, specific heats, refractive index, and uranium extraction coefficients. (auth)

8749
CRYSTALLIZATION TEMPERATURES OF URANYL NITRATE–NITRIC ACID SOLUTIONS. R. G. Hart (Atomic Energy of Canada, Ltd., Chalk River, Ont.) and G. O. Morris (Imperial Chemical Industries, Ltd., Widnes, Eng.). pp. 544-5 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The crystallization temperatures of uranyl nitrate–nitric acid solutions in water in the range 0 to 10 M nitric acid and 100 to 500 g of uranium per liter are presented. (auth)

8750
TRI-n-BUTYL ORTHOPHOSPHATE (TBP) AS AN EXTRACTING SOLVENT. H. A. C. McKay and T. V. Healy (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 546-56 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

The physical properties and solubilities of various inorganic compounds in tri-n-butyl orthophosphate are presented. (W.L.H.)

8751
STRUCTURES AND SOURCES OF EXTRACTION REAGENTS. K. B. Brown (Oak Ridge National Lab., Tenn.). pp. 557-9 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

8752
SOLVENTS FOR EXTRACTION PROCESSES. pp. 560-1 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Tables are presented of solvents which have been chosen for operations in a full-scale production plant or have been considered for such use. (W.L.H.)

8753
RADIOACTIVITY ASSOCIATED WITH URANIUM, THORIUM, AND PLUTONIUM. S. A. Reynolds (Oak Ridge National Lab., Tenn.). pp. 562-72 in "Progress in Nuclear Energy. Series III. Process Chemistry. Volume 2."

Nuclear data for the common isotopes of uranium, thorium, and plutonium are tabulated. Methods of calculation of daughter "build-up" are illustrated. (auth)

8754
ORGANIC SILICON COMPOUNDS. K. A. Andrianov. Translation of "Kremniy-organicheskiye Soedineniya." Ohio, Wright-Patterson Air Force Base, 1958. 921p. Available from Office of Technical Services, Washington for $10.00.

Information is presented on the methods of preparation and physical and chemical properties of a large number of monomeric organosilicon compounds, as well as the methods of preparation, properties, and applications of high-polymer organosilicon compounds. (auth)

Radiation and Radiochemistry

Refer also to abstract 8733.

8755 CCC-454-TR-299
Callery Chemical Co., Penna.
B^{10} ISOTOPE ABUNDANCE IN SOME BORON COMPOUNDS. R. S. Braman—S. L. Harvey, ed. Sept. 25, 1958. 14p. Project ZIP. Contract NO(a)s-58-454-d.

A method was developed for the measurement and comparison of the B^{10} isotope abundance by neutron absorption. Diborane and some higher boron hydrides were found to be enriched in the B^{10} isotope. All B^{10} enriched materials were found to have approximately the same B^{10} abundance, 20.71 ± 0.22 at.% when compared to commercial boric acid with an assumed B^{10} abundance of 19.98 at.%. (auth)

8756 CEA-845
France. Commissariat à l'Énergie Atomique, Paris.
ANALYSE ISOTOPIQUE DE L'URANIUM PAR SPECTROSCOPIE OPTIQUE. (Isotope Analysis of Uranium by Optical Spectroscopy.) S. Gerstenkorn. June 1958. 20p.

Isotopic analysis of uranium is made by means of hollow cathode lamp and a Fabry-Perot photoelectric spectrometer. The line UI, 5027 A is used. This method allows a determination of the isotopic concentrations in U^{235} down to 0.1%. The relative precision is about 2% for amounts of U^{235} over 1%. For weaker amounts this line allows relative measurements of better precision when using standard mixtures. (auth)

8757 IGO-AM/W-185

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

THE RADIOCHEMICAL DETERMINATION OF STRONTIUM 89 AND STRONTIUM 90 IN VEGETATION, FISH AND SEAWEED ASH. 1959. 16p. $0.35(BIS).

Radio-strontium, together with added strontium carrier, is chemically separated, and the β activity is measured. After allowing the daughter element yttrium-90 to grow in nearly to equilibrium, radio-yttrium together with added yttrium carrier is chemically separated, and the β activity is measured. The counting equipment is calibrated against sources of known strontium-89 and strontium-90 activities. (auth)

8758 NYO-3984

Pennsylvania State Univ., University Park. Coll. of Chemistry and Physics.

RADIATION INDUCED REACTIONS BETWEEN IODINE AND ETHYL IODIDE. Conrad N. Trumbore and Warren W. Miller. Jan. 1, 1956. 30p. Contract AT(30-1)-1444. $4.80(ph), $2.70(mf) OTS.

A kinetic study was carried out on the radiation-induced reactions in a solution of iodine in ethyl iodide, using I^{131} for both the radiation source and tracer for some of the chemical reactions. Within a particular region of concentration and radiation intensity the rate of the reaction $C_2H_5I + I_2 \rightarrow C_2H_5I + I_2$ follows the rate law $dIx/dt = k(EtI)^{1/2}(I_2)^{1/2}(Rad)^{1/2}$. From a reaction mechanism in which hot ethyl radicals recoil from the track of the ionizing radiation and react with iodine molecules this same rate law can be derived. (auth)

8759 ORO-190

Florida State Univ., Tallahassee.

RADIATION INDUCED EFFECTS IN HETEROGENEOUS ORGANIC SYSTEMS. Progress Report for Period March 15, 1956 to March 15, 1957. Russell H. Johnsen. 16p. Contract AT(40-1)-2001. $3.30(ph), $2.40(mf) OTS.

An investigation of the effect of radiation on heterogeneous systems of aliphatic hydrocarbons and alkali metals is presented. It was proposed that systems composed of a pure liquid hydrocarbon in contact with a freshly prepared metallic surface be irradiated and the resulting metal alkyls be determined for quantity produced and molecular structure. In addition to this a number of additional factors was investigated. These included the effect of the presence of the metal on the total gas yield, the role of the nature of the surface on gas and metal alkyl yield and the general nature of the radiolytic decomposition of saturated hydrocarbons. (W.L.H.)

8760 AEC-tr-3535

THE EFFECT OF γ AND α RADIATION ON PLUTONIUM SOLUTIONS. M. Pagés and M. Haissinskii (Haissinsky). Translated by R. E. Biggers (Oak Ridge National Lab.) from Report A/CONF.15/P/1156, 1958. 7p. $3.30(ph), $2.40(mf) JCL or LC.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 6446.

8761 AEC-tr-3560

ROLE OF OXYGEN RADICALS IN OXIDATION AND THE REDUCTIONS PRODUCED BY IONIZING RADIATION. III. ARSENITE-ARSENATE SYSTEM. M. Haissinskii (Haissinsky) and M. Lefort. Translated by A. L. Monks (Oak Ridge National Lab.) from J. chim. phys. 48, 429-37(1951). 17p. (Figures omitted). $3.30(ph), $2.40(mf) JCL or LC.

Arsenous ions in aqueous solutions are completely oxidized by α rays of Rn; there is no inverse reaction observed. The x rays result in a radiochemical equilibrium which is displaced in favor of the reduced state with an increase in acidity. The x rays in a sufficiently concentrated solution of arsenite produce at the same time as oxidation, a partial precipitation of the As element considered as a direct effect of the irradiation. The effect of the concentration, temperature, and pH on the oxidation yields was determined, and the composition of the micro-gaseous mixtures (H_2-O_2) produced was analyzed. An examination of these kinetic results leads to the conclusion that oxidation by α rays can be due essentially to the effect of H_2O_2 produced by the radiolysis of water, while for x rays it would have an effect of competing for the OH^- radicals which would be capable of oxidizing AsO_2^- as well as reducing AsO_4^{3-}, probably passing by an unstable AsO_4 compound. (auth)

8762 CEA-tr-A-277

IDENTIFICATION D'ÉLÉMENTS RADIOACTIFS PAR CHROMATOGRAPHIE SUR PAPIER. (Identification of Radioactive Elements by Paper Chromatography.) H. Gotte and D. Patze. Translated into French from Z. Elektrochem. 58, 636-41(1954). 12p.

A paper chromatographic method is presented for the identification of fission products not precipitated by hydrogen sulfide. The method is applicable to Cs, Sr, Ba, Y, the rare earths, Zr, In, and Cd when the elements are in a concentrated solution of hydrochloric acid. The experimental curves of the activities are given. (J.S.R.)

8763 CEA-tr-R-362

ETAT DE FAIBLES QUANTITÉS DE RADIO-ÉLÉMENTS DANS LES SOLUTIONS. (State of Low Quantities of Radioelements in Solutions.) I. E. Starik and A. V. Kossitzyne. Translated into French by B. Vinogradoff from Zhur. Neorg. Khim. 2, 444-51 (1957). 19p.

The adsorption by glass of trivalent and tetravalent Ru in hydrochloric acid solutions at concentrations from 10^{-4} to 10^{-7} M was studied as a function of pH. The range of existence of colloidal Ru was determined in the solutions studied by the ultrafiltration method. It was established that the adsorption of Ru by glass has a maximum in a narrow interval of the pH values, corresponding to the passage of Ru to the colloidal state. The products of approximate solubility were calculated from the results of the investigations on the colloidal state of trivalent and tetravalent Ru. (tr-auth)

8764 CEA-tr-R-491

ACTION DES RAYONS X SUR LES POLYAMIDES. (Action of X Radiation on Polyamides.) B. L. Tsetlin (Tsetline) and S. R. Rafikov. Translated into French from Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk, 1411-13(1957). 10p.

The results of a study on the effects of intense x radiation on the thermomechanical properties of elongated and nonelongated samples of polyhexamethyleneadipamide and the polyamide produced from the simultaneous condensation of hexamethylenediamine

with azelaic and adipic acids and caprolactame are presented. It is shown that under the action of radiation there appear in the polyamides vulcanization phenomena by irradiation and destruction of the crystalline structure. (J.S.R.)

8765 CEA-tr-R-585

STRUCTURE ET PROPRIETES DES CAOUTCHOUCS, PRODUITS DE LA VULCANISATION PAR IRRADIATION. (Structure and Properties of Rubber. Products of Irradiation Vulcanization.) B. A. Dogadkin (Dogadkine), Z. N. Tarasova (Tarassova), V. L. Karpov, M. Ya. Kaplunov (Kaplounov), and N. A. Klauzen (Klaouzen). Translated into French by B. Vinogradoff from Kolloid. Zhur. 20, 260-71(1958). 27p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 2537.

8766

EFFECT OF 31 Mev GAMMA AND 200 kv ROENTGEN WHOLE-BODY IRRADIATION ON THE NUCLEIC ACID CONTENT OF MOUSE TISSUES. Sonja P. Subotič-Nikolić and Adolf Zuppinger (Univ. of Bern). Acta Radiol. 51, 74-80(1959) Jan.

A comparative study of the effects of 31-Mev gamma and 200-kv roentgen rays on nucleic acids and their low-molecular derivatives content in mouse spleen, thymus, and liver was performed. No significant differences could be proved in the radiation response of these substances, suggesting that the ratio of intensity of the biologic effect studied was near unity for the two energies in question. (auth)

8767

A POTASSIUM STANDARD FOR RADIOACTIVITY MEASUREMENT. A. G. Kostritsa (Inst. of Infectious Diseases, Academy of Medical Sciences of the USSR, Kiev). Biophysics (USSR) (English Translation) 3, 232-5(1958).

A technique for preparation of an active standard made from potassium chloride is described. The standard is applied in laboratory measurement of weak radioactivity in specimens, taking into account statistical variations and absorption of β radiation by a layer of the specimen according to the atomic weight and the thickness of the layer. Various applications of the standard are discussed. (J.R.D.)

8768

DIRECT MEASUREMENT OF URANIUM AND THORIUM BY GAMMA SPECTROSCOPY. C. Brooke, E. Picciotto, and G. Poulaert (Université Libre de Brussels). Bull soc. belge géol. paléontol. hydrol. 67, No. 2, 315-28(1958). (In French)

The development of gamma spectrometric methods for determining U and Th and the usefulness of the techniques in geochemical and geochronological research are discussed. Experiments are described in which Th and U are determined simultaneously in weighed artificial mixtures by gamma spectroscopy. The error increased when the concentrations decreased and also increased when the U/Th ratio was different from 1. The error ranged from 1% for concentrations near 0.1 g/g to 10% for concentrations of several mg/g. To maintain the error in Th and U determination at less than 10%, the U/Th ratio should be between 0.1 and 10. For source densities of about 0.2 g/cm^3 the determination is not affected by variations in the density or nature of the sample. The determination can be made in 30 min, directly on a powder of the mineral or rock. (T.R.H.)

8769

DECOMPOSITION OF METAL–PORPHYRIN COMPLEXES BY GAMMA IRRADIATION. H. N. Dunning and J. W. Moore (U. S. Dept. of the Interior, Bartlesville, Okla.). Ind. Eng. Chem. 51, 161-4(1959) Feb.

Samples of porphyrins, metal–porphyrin complexes, and crude oils containing metal–porphyrin complexes were subjected to high dosages of gamma irradiation. The effects of irradiations on the bulk properties of an asphaltic crude oil and a mid-continent lubricating stock were also investigated. Irradiation at the 200 Mr level produced small increases in the viscosities, acid numbers, and specific gravities of the petroleum samples, and metal–porphyrins were found to be very stable in petroleum. The protective action of petroleum may have some application in nuclear engineering. (J.R.D.)

8770

USE OF RADIOACTIVE ISOTOPES IN STUDYING THE SPATIAL DISTRIBUTION OF ELEMENTS IN DIRECT CURRENT ARC PLASMA DURING SPECTROCHEMICAL DETERMINATION OF IMPURITIES IN URANIUM. E. E. Vainshtein (Vainstein) and Yu. I. Belyaev (V. I. Vernadsky Inst. of Geochemistry and Analytical Chemistry, Academy of Sciences, Moscow). Intern. J. Appl. Radiation and Isotopes 4, 179-88(1959) Jan.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 116.

8771

METAL LOADED SCINTILLATOR SOLUTIONS. A. R. Ronzio (Los Alamos Scientific Lab., N. Mex.). Intern. J. Appl. Radiation and Isotopes 4, 196-200(1959) Jan.

The scintillation efficiency of various scintillating solutions containing hydrocarbon soluble salts of cadmium, lead, bismuth, uranium, and iron was compared. The directions for the preparation of the salts are given. The pulses obtained from cesium-137 were compared by means of a pulse height analyzer. (auth)

8772

STABILITY OF THE CATION EXCHANGE RESINS. V. A. Nikashina, A. Kh. Breger, M. M. Senyavin, and A. V. Gordievskii (Inst. of Physics, Academy of Sciences, USSR, Moscow). Intern. J. Appl. Radiation and Isotopes 4, 201-9(1959) Jan.

The chemical stability to x, β, and γ radiation of air-dry cation exchange resins in the H form has been studied in connection with the use of ion-exchange resins for absorption and separation of radioactive substance mixtures. Variations in the exchange capacity, degree of swelling, and chemical stability of the resins have been investigated experimentally. The nature of these variations in properties of the cation-exchange resins investigated has been shown to be similar on exposure both to x and γ rays and to fast electrons. Decrease in exchange capacity and chemical stability and variations in swelling are observed after exposure. Most affected by irradiation are ion-exchange resins of aliphatic structure. A higher degree of degradation is observed on irradiation of cation-exchange resins in the presence of air. (auth)

8773

PREPARATION OF CARRIER FREE RADIOFLUORIDE WITH A NEW ESTIMATE OF THE HALF-LIFE OF F^{18}. C. H. Carlson, L. Singer, D. H. Service, and W. D. Armstrong (Univ. of Minnesota, Minneapolis). Intern. J. Appl. Radiation and Isotopes 4, 210-13(1959) Jan.

A method for producing carrier free radiofluoride in aqueous solution using proton bombardment of O^{18} en-

riched water is described together with a new estimate of 109.7 minutes for the half life of F^{18}. (auth)

8774

THE DETERMINATION OF COPPER AND ZINC IN BIOLOGICAL MATERIAL BY ACTIVATION ANALYSIS. H. J. M. Bowen (Wantage Radiation Lab., Grove, Berks, Eng.). Intern. J. Appl. Radiation and Isotopes 4, 214-20 (1959) Jan.

A method is described for the determination of copper and zinc in biological material using the technique of activation analysis. The limit of detection of the method is 4×10^{-10} g for copper, and 5×10^{-8} for zinc. The method has been used to determine copper and zinc in single seeds and in human blood. The seeds of tomato plants grown under controlled conditions contained about 8 ppm of copper and 150 ppm of zinc. The mean copper in the blood of 16 subjects was found to be 75.5 μg/100 ml, and the mean zinc 0.77 mg/100 ml. (auth)

8775

MICRO-DETERMINATION OF ZINC IN BLOOD AND OTHER TISSUES BY NEUTRON ACTIVATION ANALYSIS. T. E. Banks, R. Tupper, E. M. A. White, and A. Wormall (Medical Coll., of St. Bartholomew's Hospital, London). Intern. J. Appl. Radiation and Isotopes 4, 221-6(1959) Jan.

A method is described for the determination, by radioactivation analysis, of zinc in small amounts of blood and tissues. The method gives results in good agreement with those determined by a standard chemical technique. Excellent recoveries of zinc added to blood samples were obtained. (auth)

8776

THE STANDARDIZATION OF RADIOISOTOPES BY THE BETA-GAMMA COINCIDENCE METHOD USING HIGH EFFICIENCY DETECTORS. P. J. Campion (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Intern. J. Appl. Radiation and Isotopes 4, 232-48(1959) Jan.

Corrections pertaining to absolute disintegration rate determinations by the $4\pi\beta-\gamma$ coincidence method are discussed. It is demonstrated that because of the high efficiency of the 4π detector most corrections are small. In general, the largest corrections, apart from background, are those due to the accidental coincidence rate and dead time losses, expressions for which are derived. A $4\pi\beta-\gamma$ coincidence apparatus is described. An account of the performance of this instrument is given, together with the experimental verification of the accidental coincidence rate and dead time corrections. The performance suggests that accuracies of the order 0.1 per cent are now feasible. (auth)

8777

LIQUID SCINTILLATORS CONTAINING METALLIC IONS. R. C. Axtmann and LeConte Cathey (E. I. du Pont de Nemours and Co., Aiken, S. C.). Intern. J. Appl. Radiation and Isotopes 4, 261(1959) Jan.

The properties of a series of liquid scintillators containing tri-n-butyl phosphate and dissolved metallic ions were investigated for possible use in counters. The findings are summarized. (C.H.)

8778

THE IRRADIATION OF INDIGOCARMINE WITH α-PARTICLES AND X-RAYS. M. C. Anta and M. L. Roda Santos (Instituto de Alta Cultura, C.E.E.N., Lisbon). Intern. J. Appl. Radiation and Isotopes 4, 261-4(1959) Jan.

The study of the bleaching of indigocarmine in aqueous solutions by α and x radiations lead to the conclusion that the yield of the chemical change depends on the type of radiation and on the dose-rate. This transformation continues after the irradiation is finished, and the after-effect may be attributed, in part, to the hydrogen peroxide formed in the irradiated solutions. (auth)

8779

STRUCTURAL CHEMISTRY OF PROMETHIUM. M. Bruno and U. Croatto (National Research Council, Padua). Nature 183, 601(1959) Feb. 28.

A method using promethium-147 was employed to investigate the structural behavior of promethium sesquioxide. Measurements of radioactivity were carried out systematically over a large range of temperatures to determine the distribution of promethium sesquioxide between two nonsoluble solid phases: one with a fluorite lattice and the other with a hexagonal structure. These phases were solid solutions of cerium, praseodymium and thorium dioxides saturated with sesquioxides, and sesquioxides in the hexagonal form saturated with dioxides, respectively. The two solid phases were separated by dissolving the hexagonal phase only with suitable solvents. The investigation indicates that over a large range of temperatures promethium sesquioxide has nearly fluoritic structure. (J.H.M.)

8780

FLEXIBLE COBALT FACILITY WILL HOLD UP TO 10^6 CURIES. Nucleonics 17, No. 2, 102-3(1959) Feb.

An irradiation facility designed to test lubricants by subjecting them to a combination of mechanical stress, high temperature, oxidative atmosphere, and gamma radiation is described. The radiation source is high-specific-activity Co^{60}. The facility was built at the Southwest Research Institute under the sponsorship of Pratt and Whitney Aircraft. (J.H.M.)

8781

REVISION OF THE POLAROGRAPHIC TECHNIQUES FOR URANIUM DETERMINATION. Maria Teresa Aguas da Silva. Técnica (Lisbon) 23p. (1953) Oct.

The polarographic behavior of uranyl ion in different supporting electrolytes was studied. Quantitative determination for 20 to 80 or 1 to 60 μg U_3O_8 per milliliter was carried out. For some supporting electrolytes the interference of iron, copper, and aluminum was studied. (auth)

Separation Processes for Pu and U

Refer also to abstracts 8729, 8730, 8736, 8738, 8739, 8740, 8746, and 9424.

8782 CF-58-11-69

Oak Ridge National Lab., Tenn.

RADIOCHEMICAL REPROCESSING COSTS IN AN EXPANDING NUCLEAR ECONOMY. C. E. Guthrie. Nov. 20, 1958. 20p. Contract [W-7505-Eng-26]. $3.30 (ph), $2.40(mf).

For presentation at the 1959 Nuclear Congress, Cleveland, April 5-10, 1959.

An analysis of reprocessing costs as a function of plant size indicates that reasonable (0.35 mills/kwh) costs may be attained by private industry around 1970. It could be advantageous to stockpile spent fuel during the early years rather than build small plants to process the fuel as discharged. (auth)

8783 CF-58-11-82
Oak Ridge National Lab., Tenn.
THE DAREX PROCESS: PROGRESS SINCE THE 1958 GENEVA CONFERENCE. F. G. Kitts, B. C. Finney, and J. H. Goode. Nov. 28, 1958. 24p. Contract W-7405-eng-26. $4.80(ph), $2.70(mf) OTS.

For presentation at the American Chemical Society's Nuclear Technology Symposium, Boston, April 5-10, 1959.

Darex Process is a head-end process for stainless steel-containing fuels consisting basically of three steps: (1) dissolution in dilute nitric–hydrochloric acid, (2) chloride removal, and (3) solvent extraction feed adjustment. The process may be carried out continuously, semi-continuously, or batchwise using nitric acid concentrations from 61 to 95 wt. %. Apparatus for continuous operation including instrumentation for the controlled recycle of concentrated nitric acid was assembled and operated to process APPR fuel elements. Reflux flowsheets were developed on a 1 to 2 liter scale for both batchwise and semi-continuous operation using either 95 or 61 wt. % nitric acid to volatilize and/or decompose chloride. These four flowsheets, employing a period of refluxing with high nitric acid concentrations, accomplished chloride removal to less than 350 ppm by the batchwise addition of only the amount of nitric acid consumed per batch. A batchwise Recycle flowsheet was also developed which uses an excess of 61% nitric acid, added continuously, with a 61% nitric acid recycle in addition to the aqua regia recycled to the dissolution step. A 6-in. ID continuous dissolver 9 ft high and a 4 in. ID chloride removal and feed adjustment tank were constructed and operated to verify flowsheet and equipment performance. (auth)

8784 CF-59-1-115
Oak Ridge National Lab., Tenn.
DISSOLUTION OF ZIRCONIUM MATRIX FUELS IN MOLTEN FLUORIDE SALTS. R. W. Horton and M. E. Whatley. Jan. 30, 1959. 18p. Contract [W-7405-eng-26]. $3.30(ph), $2.40(mf) OTS.

For presentation at the American Chemical Society's Nuclear Technology Symposium, Boston, April 5-10, 1959.

The application of the Volatility Process for reprocessing spent reactor fuels to zirconium fuel elements requires the conversion of the fuel to a fluoride form. This conversion can be accomplished by the dissolution of such fuels in a bath of molten fluoride salts with a hydrogen fluoride sparge. Studies with dummy zirconium fuel elements showed dissolution rates averaging 2 mg/sq cm-min. The effect of submergence, geometrical configuration, and HF impingement rate appeared more significant than the effect of temperature. Experiments with partially submerged elements have indicated that at temperatures in the neighborhood of 700°C the gas phase reaction rate can exceed the salt phase rate. The use of the process involves problems with corrosion, with entrainment of solids in the off gas, and with the recovery and recycle of the hydrogen fluoride. Tentative solutions to these problems have been studied. (auth)

8785 HW-54046
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
INTEGRATED MAINTENANCE MANAGEMENT IN THE CHEMICAL PROCESSING DEPARTMENT. A CASE STUDY FROM THE REDOX PLANT. Dec. 12, 1957. 30p. Contract W-31-109-Eng-52. $4.80(ph), $2.70(mf) OTS.

An integrated maintenance management program is outlined. There are two fundamental aspects of the program in which positive results were realized, such as actions by the plant manager to obtain proper, harmonious, and cooperative relationships among the functional groups, and the integration of the various services and crafts within the maintenance organization to assure effective control of materials and manpower. Manpower needs were reduced by approximately 20%. The work backlog was reduced from three or four months to less than one month. Overtime and emergency work were reduced through organized planning and scheduling of preventive maintenance. Measurement systems provide a base for the evaluation of future changes, and the organization has sufficient breadth and depth to encompass major problems and facilitate delegation of minor problems. (auth)

8786 AEC-tr-3584
EXTRACTION OF URANYL SULFATE BY AMINES. (Extraction du Sulfate D'Uranyle par les Amines.) Ch. Boirie. Translated by A. L. Monks (Oak Ridge National Lab.) from Bull. soc. chim. France, Nos. 8 and 9, 1088-93(1958). 25p. (Includes original, 12p.) $4.80(ph), $2.70(mf) JCL or LC.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 17032.

8787 CEA-tr-R-372
SALICYLATES D'URANIUM ET DE THORIUM. (Salicylates of Uranium and Thorium.) O. E. Zvyagintsev (Zviaguintzev) and B. N. Sudarikov (Soudarikov). Translated into French from Zhur. Neorg. Khim. 2, 128-37(1957). 28p.

If hexavalent uranium is placed in weakly acidic solutions containing ammonium salicylate, it is precipitated in the form of orange prisms with the composition $NH_4UO_2(C_7H_5O_3)_3 \cdot 4H_2O$. The solubility of ammonium uranyl salicylate was determined in water and in ammonium salicylate solutions as a function of the pH of the medium, the concentration of the salicylate ion, and the temperature. Experiments on titration have shown that in an alkaline medium, hexavalent uranium in the presence of the salicylate ion forms the anion $UO_2(C_7H_5O_3)_3^{4-}$. The formation conditions for this anion complex were established, and it was determined that the anion is stable and does not hydrolyze on heating. The solubility of thorium salicylate $ThO(C_7H_5O_3)_2$ was studied in water and in ammonium salicylate solutions as a function of temperature, pH of the medium, and concentration of the salicylate ion. The concentration of thorium in the filtrate during the deposition of thorium salicylate and oxysalicylate was determined as a function of the same factors. (tr-auth)

8788
HOW WILL WE PROCESS ADVANCED REACTOR FUELS? F. S. Martin (United Kingdom Atomic Energy Authority, Springfield Works). Atomic World 10, 18-21, 40(1959) Jan.

Information is presented on head-end steps for processing advanced reactor fuel elements which are not directly soluble in nitric acid. Discussions are included on the application of the following head-end steps: Darex, anodic dissolution, carburization, molten metal, hydrofluoric acid, and Zircex. (J.H.M.)

8789
NUCLEAR FUEL PROCESSING, A CHALLENGE FOR THE FUTURE. J. L. Schwennesen (U. S. Atomic Energy Commission, Idaho Falls, Idaho). Chem. Eng. Progr. 55, No. 2, 80-4(1959) Feb.

Two panel discussions are presented on: future chemical and engineering potentialities in nuclear fuel processing, and when and under what conditions private industry may participate. (T.R.H.)

8790
ENGINEERING DEVELOPMENTS IN FLUORIDE VOLATILITY. Justin T. Long (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 169-73(1959) Feb.

Fused salt handling in the fluoride volatility process for production of UF_6 was investigated. In addition, the reaction of fluorinating agents with fused salt melts and the distillation of inorganic compounds were examined. Fused salt process lines were made of Inconel and electrically heated by tubing wall resistance. Equipment for fused salt–gas reactions included a dip tube, a percolator tube, and a sieve plate. Application of this equipment is described along with a discussion of the theory of contacting efficiency in bubble beds and the effect of variables such as vessel content stirring on the reaction efficiency. In distillation investigations it was concluded that the height equivalent to a theoretical plate for systems involving UF_6 or other dense substances may best be found by doubling the value obtained for hydrocarbon systems. (J.R.D.)

8791
CHEMISTRY OF PROCESSING METALLIC URANIUM FUEL ELEMENTS WITH CHLORINE TRIFLUORIDE. H. A. Bernhardt, E. J. Barber, and R. A. Gustison (Union Carbide Nuclear Co., Oak Ridge, Tenn.). Ind. Eng. Chem. 51, 179-84(1959) Feb.

A fluorination process for converting irradiated uranium directly to UF_6 by reaction with a solution of liquid ClF_3 and HF is described. The UF_6 is separated from the reaction mixture, and PuF_4 and fission product fluorides by distillation. The nonvolatile plutonium and fission product fluorides are subsequently dissolved by aqueous treatment for processing. The basic chemistry of the process is examined, as well as the mechanism of reaction, plutonium fluoride dissolution, and corrosion. In addition, results of pilot plant experiments using irradiated uranium metal are described. (J.R.D.)

CONTROLLED THERMONUCLEAR PROCESSES

8792 AECU-3889
Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.
ULTRAHIGH VACUUM TECHNIQUES. Progress Report. Research Report 100FF1054-R2. June 28, 1957. 31p. Contract AT-11-1-gen-14. $6.30(ph), $3.00(mf) OTS.

Studies were continued on the development of essential vacuum components and the design of larger and more effective vacuum systems. A total of five systems were used for testing components and for basic investigations of ultrahigh vacuum. Specifically treated are results from tests of the Consolidated MCF-300 pumps, performance of the liquid nitrogen trap at 4×10^{-9} mm Hg, and the performances of an all-metal flap valve and a metal-nose-to-metal-seat valve. Research directed toward establishing the limiting factors in ultrahigh vacuum techniques is reviewed. (For preceding period see AECU-3888.) (D.E.B.)

8793 AECU-3890
Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.
ULTRAHIGH VACUUM TECHNIQUES. Progress Report No. 3 [for] July 1 to December 31, 1957. Research Report 403FF220-R1. Dec. 31, 1957. 13p. $3.30(ph), $2.40(mf) OTS.

Development of components including pumps, traps, flanges, and valves is described. Research on factors limiting the attainment of ultrahigh vacuum is discussed. A phase of the program concerning the removal of noble gases from a volume via ion bombardment and subsequent release of these trapped gases by bombardment with different noble gases was completed. (For preceding period see AECU-3889.) (W.D.M.)

8794 NYO-2391
Princeton Univ., N. J. Project Matterhorn.
THE STELLARATOR APPROACH TO THERMONUCLEAR POWER. Robert G. Mills. Dec. 16, 1958. 20p. Contract AT(30-1)-1238. $3.30(ph), $2.40(mf) OTS.

The stellarator concept and methods of confinement, stability, heating, and impurity control are explained. The program's present status is presented. Future possibilities are briefly considered. (auth)

8795 NYO-7883
Princeton Univ., N. J. Project Matterhorn.
SOME OBSERVATION ON THE BEHAVIOR OF COPPER TRAPS AND UHV SYSTEMS OF MODERATE SIZE. Technical Memo No. 40. Donald J. Grove. Feb. 17, 1957. 18p. Contract AT(30-1)-1238. $3.30(ph), $2.40(mf) OTS.

Results obtained in experiments with a high vacuum system using a copper trap in conjunction with a glass two-stage diffusion pump are described. Construction details of the system and the trap are given along with a schematic and photographs. Experimental procedure and conditions are described, and the results are presented graphically. Sources of error are considered, among which is the vapor pressure associated with Octoil-S. (J.R.D.)

8796 NYO-8070
Princeton Univ., N. J. Project Matterhorn.
PRINT AND PUNCH MODIFICATION OF FOR TRANSIT. Technical Memo 67. John M. Greene. Feb. 9, 1959. 11p. Contract AT(30-1)-1238. $3.30(ph), $2.40(mf) OTS.

An optional modification of the FOR TRANSIT was written to obtain the advantages of on-line printing of the results of a computation. This modification will also give other results from the same program on punched cards. Details and the structure and possible changes of the modification are given. (W.D.M.)

8797 NYO-8073
Princeton Univ., N. J. Project Matterhorn.
REPORT OF TESTING ON A TYPE 5553 IGNITRON. Technical Memo 66. Charles A. Nittrouer. Feb. 26, 1959. 11p. Contract AT(30-1)-1238. $3.30(ph), $2.40 (mf) OTS.

Preliminary information regarding the 5553 ignitron is presented. The results obtained regarding such characteristics as voltage stand-off in the forward and inverse directions, arc transfer to the wall of the tube,

ampere-second rating at high currents, and subsequent high voltages are discussed. In addition, firing characteristics, parallel firing techniques, and operation in a firing circuit are considered. It was concluded that either of two types of circuits will give good firing. Plans for future work are outlined. (J.R.D.)

8798 UCRL-3188

California. Univ., Berkeley. Radiation Lab.

ARC RESEARCH. SOME CONSIDERATIONS ON THE APPLICATION OF THE A-48 TO THE SHERWOOD PROGRAM. John R. Hiskes. Nov. 7, 1955. 8p. $1.80 (ph), $1.80(mf) OTS.

The large beam currents anticipated from the A-48 accelerator suggest its possible application to the Sherwood Program. One possible application considered is a proposal to accelerate molecular ions to high energies for injection peripherally into a mirror machine and to exploit the fact that at the high energies available the various cross sections for the loss mechanisms are falling off much more rapidly with energy than the cross sections for the gain processes. Taking as an example a 250 ma H_2^+ molecular ion beam current it is shown that it may be possible to achieve values for $\beta = (8\pi\ nKT)H_2$ ranging from 1 to 100% in times ranging from milliseconds to tens of seconds. The β's are achieved by injecting the beam into a mirror machine containing a neutral gas density corresponding to a pressure of 10^{-3}mm Hg to 5×10^{-4}mm Hg. The possibility of accelerating D_2^+ ions in the A-48 accelerator is also discussed. (A.C.)

8799 UCRL-5431-T

California. Univ., Berkeley. Radiation Lab.

THREE IDEAS RELATING TO E × H THERMONUCLEAR MACHINES. Harold P. Furth. Dec. 11, 1958. 9p. $1.80(ph), $1.80(mf) OTS.

An outline is presented of an Omnitron source scheme in which the sheath voltage is not carried over into the reactor region. The lines of force defining the region of greatest potential drop are bent so that they return to the center electrode, rather than extending to the reactor chamber. The sheath electrons follow the bent lines of force, and the ions follow the main magnetic field pattern outside the sheath. With such a design it is possible in principle to transfer ions from the Omnitron to the reactor region without also transferring the problems associated with the sheath and electrode stability. In addition, a method for increasing the size of the circulating ion beam is described. This is achieved by increasing the number of concentric sheaths, using ring electrodes at the ends. Also a method of plasma heating for the Homopolar by means of an alternating radial electric field is described. The method consists of the application of a d-c component of radial electric field in creating centrifugally enhanced confinement in addition to the axial confinement associated with the normal mirror machine operation. (J.R.D.)

8800

THE DIRECT CONVERSION OF THERMONUCLEAR ENERGY TO ELECTRICAL POWER IN THE STABILIZED PINCH. R. J. Bickerton and J. D. Jukes (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Nuclear Energy 8, 206-14(1959) Jan.

A method is suggested whereby the energy liberated by the thermonuclear reactions in a stabilized, pinched discharge may be converted directly into electrical power. Physical criteria are derived which must be satisfied by the discharge. A comparison is made between the direct conversion method and one in which an external heat cycle is used. (auth)

8801

FUSION OF HEAVY HYDROGEN. T. E. Allibone (Associated Electrical Industries, Ltd., Aldermaston, Eng.). Nature 183, 569-73(1959) Feb. 28.

From information that was revealed at the 1958 Geneva Conference, a review is presented of the progress that is being made on thermonuclear research. Consideration is given to the theory of fusion and different methods and equipment that are being used to produce thermonuclear reactions. Various experimental thermonuclear machines are also discussed. (J.H.M.)

8802

EXPERIMENTAL DEMONSTRATION OF HYDROMAGNETIC WAVES IN AN IONIZED GAS. G. A. Sawyer, P. L. Scott, and T. F. Stratton (Los Alamos Scientific Lab., N. Mex.). Phys. of Fluids 2, 47-51(1959) Jan.-Feb.

A regular hydromagnetic oscillation was excited in a linear discharge tube with metal walls. An externally applied axial magnetic field and discharge currents less than 10^4 amperes were essential to the production of the oscillation. Complete spatial current distributions derived from measurements of the radial and time dependence of the three components of magnetic field showed a helical notch (screw thread) of reduced current density which rotated with uniform angular velocity. The pitch and apparent rotational frequency of the oscillation depended on the gas density, discharge current, and applied axial magnetic field; the right- or left-handedness and rotational sense depended on the relative orientation of the applied axial magnetic field and the self field of the discharge current. The helical regularity could be described as a superposition of hydromagnetic waves traveling in the axial and circumferential directions. (auth)

8803

ON THE CONFINEMENT OF A PLASMA BY MAGNETOSTATIC FIELDS. Erich S. Weibel (Space Technology Labs., Los Angeles). Phys. of Fluids 2, 52-6(1959) Jan.-Feb.

The plasma is treated as an assembly of classical particles having masses m_+ and m_- and charges $\pm e$. It is shown that if such a plasma is in thermodynamic equilibrium it is unaffected by a magnetostatic field. In particular, it cannot be confined by a magnetostatic field and at the same time be in equilibrium. In absence of collisions there exist stationary solutions for the magnetic field and the particle distribution in phase space such that the gas is confined. The solutions are self-consistent densities, meaning that the particle motions generate the field, which in turn maintains the particle distribution. However, this distribution may not be Maxwellian. As an example the linear pinch is treated. The fields, the particle number densities, and the current density are calculated for one particular case. (auth)

8804

OHMIC HEATING IN THE B-1 STELLARATOR. W. Bernstein and A. Z. Kranz (Princeton Univ., N. J.). Phys. of Fluids 2, 57-61(1959) Jan.-Feb.

A detailed comparison between experimental data and the predictions of ohmic heating theory is made over a wide range of axial magnetic confining field, electric heating field, and helium pressure. It is found that, in the early stages of the discharge, agreement between

theory and experiment is good, and the predicted scaling laws are valid. However, experimentally it is found that it takes about 5 times longer to complete first ionization than predicted. Also, the current is seen to level off at a plateau at a time when theory predicts a continuous heating. These discrepancies are attributed to three energy sinks: cold neutral particles entering the discharge, runaway electrons leaving the discharge, and radiation from impurities. In addition, the electron density is observed to decrease during the length of the discharge (pump-out). For the early current plateau observed at low ratios of heating field to pressure, it appears that the plasma density is about 15% less at 18,000 gauss than at 27,000 gauss as a result of this pump-out. The hydromagnetic instability predicted by Kruskal and previously demonstrated to exist is given the physical characteristics of an increased rate of diffusion. (auth)

CRITICALITY STUDIES

8805 CNI-5

Italy. Comitato Nazionale per le Ricerche Nucleari, Milan.

TWO GROUP THEORY FOR CRITICALITY CALCULATIONS IN ASYMMETRICALLY REFLECTED REACTORS. S. Albertoni and C. Tamagnini. Nov. 1958. 50p.

Two-dimensional bare slab reactors are considered when there is not a plane of symmetry in the whole of the multiplying and nonmultiplying regions. The formulas are derived and sheets are given for criticality and flux calculations. (W.D.M.)

8806 IGR-R/R-219

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

UPPER AND LOWER BOUNDS FOR CRITICAL LAPLACIAN AND CRITICAL SIZE OF SOME FINITE ELLIPTICAL CYLINDERS. R. T. Ackroyd and J. M. Ball. 1957. 11p. $0.42(BIS).

Ackroyd and Ball's method for obtaining upper and lower bounds for the critical Laplacian and the critical size of an infinite elliptical cylinder is extended in this report to include some finite elliptical cylinders. Fairly close upper and lower bounds for the critical Laplacian of reflected elliptical cylinders of finite length can be obtained by virtually no more work than is required to read a chart. (auth)

8807 Y-1245

Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.

CRITICALITY CONSIDERATIONS IN THE DESIGN OF PLANTS USING U^{235}. J. D. McLendon. Jan. 20, 1959. 25p. Contract W-7405-eng-26. $0.75(OTS).

Stringent conditions are required to maintain nuclear safety in a chemical processing or metal fabrication plant which is designed to process unirradiated uranium enriched in the U^{235} isotope. A basic approach to nuclear safety methods is outlined, and brief descriptions of process configurations and layout resulting from applications of basic criticality information are presented. (auth)

8808 CEA-TR-A-497

RETINE-Y ULTRA-SENSIBLE, SANS INERTIE POUR LA FIXATION PHOTOGRAPHIQUE DU MOUVEMENT DE SUBSTANCES RADIO-ACTIVES, NOTAMMENT A L'INTÉRIEUR D'OBJETS BIOLOGIQUES. (Ultra Sensitive Y Retina Without Inertia for the Photographic Fixation of the Movement of Radioactive Substances, Primarily at the Interior of Biological Objects.) W. Fucks, G. Schumacher, and A. Scheidweiler. Translated into French from Z. Naturforsch. 12b, 250-4(1957). 15p.

A very sensitive γ retina without inertia was developed to permit the study of the movement of materials producing radiation at the interior of inaccessible spaces, such as animal or human bodies. It allows the transition from photoradiograms to radiofilm. Its sensitivity is a thousand times greater than that of retinas previously described. Its release time was raised to the point that the apparatus can be considered as free of all inertia during its utilization in medicine. The physical data of the apparatus were established. (tr-auth)

GEOLOGY AND MINERALOGY

8809 TEI-690

Geological Survey, Washington, D. C.

GEOLOGIC INVESTIGATIONS OF RADIOACTIVE DEPOSITS. Semiannual Progress Report [for] December 1, 1956 to May 31, 1957. July 1957. (Issued in two books: (Bk. 1), 224p. and (Bk. 2), 347p.). $7.00(OTS).

Progress of geologic investigations of radioactive deposits in the U. S., including Alaska, for the period from December 1, 1956 to May 31, 1957, is outlined. The work included geologic mapping, geologic topical studies, geophysical, geochemical and mineralogical investigations and laboratory services, research on techniques in the fields of radioactivity, spectrography, chemistry, and studies relating to the geology of uranium and thorium. (J.E.D.)

8810 TEI-740

Geological Survey, Washington, D. C.

GEOLOGIC INVESTIGATIONS OF RADIOACTIVE DEPOSITS. Semiannual Progress Report [for] December 1, 1957 to May 31, 1958. 320p. $5.00(OTS).

The Semiannual Reports are confined to accomplishments of the six-months period reported upon, and contained only enough of the work of preceding periods to provide a proper perspective. A considerable number of projects were completed, and final reports are in preparation for Survey publication. The more important results of these completed projects are given. The broad objective of the Geological Survey's program on behalf of the Atomic Energy Commission is the investigation of the fundamental geology, mineralogy, and geochemistry of uranium and other radioactive materials, for the purpose of discovering and delimiting areas favorable for the future production of uranium and other radioactive ores. A second and equally important objective of the program is the dissemination of information by the publication, of the results of its investigations. (auth)

8811 AEC-tr-3562

THE "PRONTO-REACTION." (Die "Pronto-Reaktion.") Paul Ramdohr. Translated from Neues Jahrb. Mineral. Monatsh., 217-21(1957). 6p. $1.80 (ph), $1.80(mf) JCL or LC.

The occurrence of brannerite in ilmenite and pitchblende of the Pronto Mine, Blind River Section of Ontario, is explained by the reaction UO_2 + (2 to 3) $TiO_2 \rightarrow UTi_{2-3}O_{6-8}$ ("Pronto Reaction"). This explains the presence of U of different periods in the same ore. The phenomenon is shown also in the Dominion Reef Series and the Witwatersrand to a lesser extent. (T.R.H.)

8812 NP-tr-224

ORGANOPHILIC URANIUM MICAS. A. Weiss, K. Hartl, and U. Hofmann. Translated by R. C. Murray (U.K.A.E.A., Atomic Energy Research Establishment) from Z. Naturforsch. 12b, 351-5(1957). 14p. $3.30(ph), $2.40(mf) JCL or LC.

Synthetic and natural uranium micas become capable of one-dimensional intracrystalline swelling in non-aqueous liquids when the inorganic cation is replaced by larger organic cations. The pronounced organophilic character of such micas may open up new possibilities for the beneficiation of rocks with low uranium content. Measurements of interlayer distances have shown that with n-alkylammonium ions of up to eight carbon atoms the alkyl chains are at right angles to the uranium mica layers. In the swollen uranium micas the straight-chain swelling liquids lie with their long molecular axes largely parallel to the n-alkylammonium ions. The interlayer distance can be calculated from the sum of the carbon atoms in ion and liquid. (J.E.D.)

8813

ISOTOPIC STUDY OF SOME COLORADO PLATEAU ORES. Donald S. Miller and J. Laurence Kulp. Econ. Geol. 53, 937-48(1958) Dec.

A number of selected uranium ore specimens from several localities have been analyzed for uranium and lead in both pitchblende and galena phases by isotope dilution techniques and the lead isotopic abundance determined. It is shown that the hypothesis of hydrothermal deposition of uranium accompanied by old radiogenic lead from the basement at one time about 60 m.y. ago does not satisfy the isotopic data. A new hypothesis is presented which requires local sources with high U/Th and U/Pb ratios, variable radon leakage, suitable ground water movement, and deposition at the site of H_2S production at low temperature. This hypothesis can explain the age discordances and the lead isotope abundances in galena. It is possible from the isotopic data to have all deposition occurring within the last five million years but it does not preclude other periods of deposition such as in Laramide time. The isotopic ages are apparent ages only and bear no direct relation to the time of deposition. The isotopic ratios, however, provide information which may be used to restrict theories of origin. (auth)

8814

SOME NATURAL VARIATIONS IN THE RELATIVE ABUNDANCE OF COPPER ISOTOPES. E. C. Walker, F. Cuttitta, and F. E. Senftle (U. S. Geological Survey, Washington). Geochim. et Cosmochim. Acta 15, 183-94 (1958) Dec.

The relative isotopic abundance of copper has been measured in a number of minerals and a few plant materials. Suites of samples from Michigan and the Colorado Plateau have been examined in more detail to determine if local variations due to isotopic exchange or diffusion could be found. The relative isotopic abundance of copper in specimens from several other localities was also determined. The variations noted were small but in some cases were felt to be significant because they were larger than the experimental error (0.1 per cent in the ratio). A total spread of −1 to +8 parts per mil compared to the standard was found in the specimens tested. (auth)

8815

ON RADIOACTIVE URANIFEROUS IRON OXIDES. M. D. Karkhanavala (Atomic Energy Establishment, Bombay). Geochim. et Cosmochim. Acta 15, 229-36 (1958) Dec.

A study has been made of uranium bearing iron oxides from the shear-zone of Bihar, with particular reference to the nature of the association of uranium with magnetite and hematite. In veins where none or very little hematitization has taken place, the primary magnetite and uraninite coexist. Where hematitization has taken place the uranium is very intimately associated with the hematite, probably as a very limited solid solution. A sample of hematite containing uranium equivalent of 0.15% U_3O_8 was found to be metamict, the reconstitution of which was established by x ray and differential thermal analysis methods. It is believed that a primary oxidizing solution containing uranyl ions caused the oxidation of the ferrous hydrosol to magnetite and the simultaneous precipitation of uraninite. A later stage oxidizing solution or normal agents of weathering converted the magnetite to hematite and the uraninite to probably U_3O_8 or UO_3, a small amount of which was then somehow taken up in the hematite lattice, and the rest being converted to secondary uranium minerals, the presence of which is known. (auth)

8816

PHYSICAL BEHAVIOR AND GEOLOGIC CONTROL OF RADON IN MOUNTAIN STREAMS. Allen S. Rogers. U. S. Geol. Survey Bull. 1052-E. 1958. 28p. and 1 illus. $0.40.

Radon measurements were made in several small turbulent mountain streams in the Wasatch Mountains near Salt Lake City and Ogden, Utah, to determine the relation between the distribution of radon and its geologic environment. In this area, the distribution of radon in streams can be used to locate points where relatively large amounts of radon-bearing ground water enter a stream, even though other evidence of springs may be lacking. These points of influent ground water are marked by abrupt increases (of as much as 2 orders of magnitude within a distance of 50 feet) in the radon content of the stream waters. This excess radon is rapidly lost to the atmosphere through stream turbulence. The rate of radon dissipation with distance of streamflow, is an exponential function, of different slopes, depending on the rate and volume of streamflow, and the gradient and nature of the stream channel. Higher radon concentrations generally can be related to specific stratigraphic horizons in the several drainage areas studied. Thus, lithologic units that act as the primary aquifers can be identified. In one area, thrust faults were found to control the influx of ground water into the stream. Based on radon concentrations in streams and related spring waters, estimates of major increments of ground water to streamflow can be made, where conventional methods such as stream gaging are not practical. The radon in the waters studied was found to be almost completely unsupported by radium in solution. (auth)

8817

SYSTEMATIC MINERALOGY OF URANIUM AND THORIUM. Clifford Frondel. U. S. Geol. Survey Bull. 1064. 408p. Available from U. S. Government Printing Office, Washington for $1.50.

Uranium and thorium minerals, together with a few rare-earth minerals containing uranium and thorium as nonessential constituents, are systematically and comprehensively described in this volume. The classification of the minerals included here is chemical. It is

based on the nature of the anion, giving rise to the following broad categories: oxides, carbonates, sulfates, molybdates, phosphates and arsenates, vanadates, silicates, and the niobate-tantalate-titanates or, more properly, multiple oxides. The phosphates and arsenates are described together because in general they are isostructural and form partial or complete solid-solution series. Within each category, minerals of analogous chemical composition and crystal structure are grouped together, such as the torbernite group of minerals within the phosphates in general. No formal distinction is made in the classification between anhydrous species and those containing water or hydroxyl. Almost all of the minerals described are hydrated. Each mineral species is described according to its synonymy, composition, crystallography and crystal habit, physical properties, optical properties, synthesis, identification, natural formation, and occurrence. The descriptive mineralogy is followed by determinative tables in which the mineral species are arranged according to their x-ray powder-diffraction interplanar spacings, chemical composition, optical properties, color, specific gravity, and fluorescence. The work is documented by more than 800 references to the world literature of the past 200 years. (auth)

8818

GEOCHEMISTRY OF URANIUM IN APATITE AND PHOSPHORITE. Geological Survey Professional Paper 314-D. Z. S. Altschuler, R. S. Clarke, Jr., and E. J. Young. Washington, U. S. Geological Survey, 1958. 50p. Available from U. S. Government Printing Office, Washington for $0.60.

Apatite contains only traces of uranium, yet as apatite is a minor constituent in most rocks and the major constituent of a few very large deposits, it accounts, paradoxically, for both dispersal and concentration of uranium in nature. Uranium typically makes up 0.001 to 0.01 percent of primary igneous apatite and 0.005 to 0.02 percent of sedimentary marine apatite. Marine reworked apatite becomes enriched in uranium to as much as 0.1 percent. This is demonstrated by the greater uranium content of the texturally more complex phases within a single deposit. Uranium can be secondarily leached from or introduced into apatite by ground water. These secondary changes are indicated by pronounced concentration gradients within single pebbles of apatite as well as by the redistribution of uranium among different mineral hosts in leached and altered deposits of phosphorite. The postdepositional enrichment of uranium in phosphorite may be entirely residual as in the Tennessee "brown-rock" deposits, or greatly enhanced by ground-water additions as in the South Carolina phosphates. Moreover, the pattern of enrichment reflects the conditions and intensities of weathering. Highly acid lateritic weathering has caused supergene enrichment of uranium in the aluminum phosphate zone of the Bone Valley formation. In contrast, surficial enrichment characterizes the moderately weathered Copper Marl of South Carolina. Isolated fossil bones or phosphate pebbles may contain almost one percent of uranium as a result of ground water enrichment. Such enrichment is comparable to the postdepositional uptake of fluorine by bone or insular phosphorite, and in some places the processes are synchronous and show good mutual correlations as they are codependent on the same ground water source. It is proposed that uranium replaces calcium in the apatite structure. This is indicated by several lines of investigation. Uranium and calcium contents are parallel in sections of leached and altered phosphorite. Ionic radii of tetravalent uranium (0.97 A) and divalent calcium (0.99 A) are virtually identical, and much of the uranium in igneous, sedimentary, and bone apatite is found to be tetravalent. Petrographic and chemical analyses and nuclear emulsion studies have shown that uranium in apatite is disseminated rather than locally concentrated. In addition, phosphate deposits are essentially devoid of uranium minerals. The igneous apatites contain from 10 to 66 percent of their uranium as U(IV). In apatite from a suite of related igneous rocks both the total uranium and the U(IV)/U(VI) ratio vary as the total uranium in the rock. Thus, the U(IV)/U(VI) ratio in igneous apatite reflects the prevalent equilibrium conditions in the crystallizing magma. In marine phosphorite thus far investigated the tetravalent uranium ranges from a few percent to more than 90 percent of the total uranium. Taken alone such statistics suggest a great variation in the initial U(IV)/U(VI) ratio of uranium emplaced in apatite. Thus, experimental evidence that bone and apatite pellets can remove uranyl uranium from solution suggests that much of the U(VI) found in natural apatite may be of primary origin, fixed as chemically adsorbed uranyl anions. It is proposed, however, that uranium in marine apatite is emplaced primarily as U(IV), structurally fixed. This follows from the fact that the higher U(IV)/U(VI) ratios are found in the younger unweathered marine apatites, and in apatites recently reworked by marine transgression. U(IV) is readily oxidized to U(VI), and postdepositional weathering, facilitated by radioactive decay, has most probably lowered the initially high U(IV)/U(VI) ratio in many older phosphorites. Apatite, by effectively removing the small amounts of U(IV) produced in sea water by reduction of $(UO_2)^{2+}$, causes more U(IV) to be produced for its own uptake. As the marine apatite is far from saturated with respect to uranium, it thus interferes with the attainment of equilibrium while fixing an unusual quantity of U(IV). The name regenerative capture is proposed for this type of concentration in which the fixation of an insignificant valence species interferes with the equilibrium producing the ion and thus generates a continuing supply for further uptake and results, ultimately, in unexpectedly large build-ups of the insignificant trace element in the host mineral. (auth)

HEALTH AND SAFETY

8819 AECU-4037

Northwestern Univ., Evanston, Ill. Technological Inst. DISPERSION IN TIDAL ESTUARIES. P. J. Huiswaard, R. B. Banks, C. G. Bell, Jr. Jan. 1, 1959. 103p. Contract AT(11-1)-353. $16.80(ph), $5.70(mf) OTS.

A number of experiments were conducted at Northwestern University with methylene blue tracer to study the influence on the diffusion process of the periodic variations of flow which are characteristic of tidal estuaries. The oscillatory movement of pollutant was also closely studied with an instantaneous injection of radioactive tritium water in the model of the Savannah Harbor. (W.D.M.)

8820 AERE-C/M-371

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment. Harwell, Berks, England.

REMOVAL OF RADIO-ACTIVE IODINE FROM MILK.

E. Glueckauf, P. Cosslett, and R. Watts. Jan. 1959. 2p. $0.12(BIS).

The removal of radioiodine from cows milk was investigated. About 30 to 60 mesh grain size commercial anion-exchange material was used as a bed through which milk was allowed to filter. Under test conditions, removal of radioiodine was 99.6% complete. Further experiments showed that the iodine can be continuously removed by an electro-chemical treatment using anion semi-permeable membranes. The latch treatment appears to be more useful. (J.R.D.)

8821 AERE-HP/R-2795

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

A PRELIMINARY SURVEY OF RADIOSTRONTIUM AND RADIOCAESIUM IN DRINKING WATER IN THE UNITED KINGDOM. N. G. Stewart, R. N. Crooks, R. G. D. Osmond, M. J. Owers, and C. Healy. Jan. 1959. 13p. $0.35(BIS)

A survey was made of the Sr^{89}, Sr^{90}, Cs^{137}, and the natural strontium and calcium in drinking water taken from thirteen undertakings in the United Kingdom in the period September 1957 to June 1958. The mean concentration of Sr^{90} was 0.45 μμc/l, 0.24 μμc/l and less than 0.01 μμc/l in lake, river and well supplies, respectively. The mean concentration of Sr^{90} in lake derived supplies was about 15 per cent and in river derived supplies about 10 per cent of that in rain. Cs^{137} levels were in general much lower than those of Sr^{90}. The Sr^{90}/Ca ratio in a typical adult diet, including the water, lay between 5.1 and 6.0 μμc/g as compared with 5.5 μμc/g for the same diet without the water. (auth)

8822 AERE-Med/R-2781

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE DETERMINATION OF ALPHA AND BETA ACTIVITY IN RAIN WATER WITH PULSE ANALYSER TYPE 1414A AND FLOW COUNTER TYPE 3-7/11559 RESPECTIVELY. W. P. Hutchinson. Dec. 1958. 7p.

Trace quantities of alpha activity present in rain water may be detected by pulse analysis in the 100 channel "kicksorter." Gross beta activity is readily detected and by using half thickness measurements an isotope with an energy of ~0.4 Mev which may be strontium-90 can be recognized. (auth)

8823 CEA-809

France. Commissariat à l'Énergie Atomique, Paris.

CONSTRUCTION DES BOÎTES À GANTS POUR LA MÉTALLURGIE DU PLUTONIUM. (Construction of Dry-boxes for Plutonium Metallurgy.) E. Grison and R. Pascard. Mar. 1958. 10p.

The dry boxes used at Châtillon are of two main types: (a) boxes with a metal frame work of welded angle-pieces and panels of plexiglas, bakelite, or duralumin. They include a standard panel which enables them to be connected to the contaminated repair workshop; (b) boxes made entirely of welded plastic. The working face only is of plexiglas held by screw-clamps to a pure rubber joint. These boxes, which cannot be connected to the contaminated workshop, are generally reserved for small pieces of chemical apparatus. None has yet been used for working under argon, although their insulation is excellent. After an interval of several hours, in fact, no decrease in the pressure inside the box can be detected. Several means can be adopted to ensure that the joints between panels and mountings are absolutely airtight. (auth)

8824 CEA-810

France. Commissariat à l'Energie Atomique, Paris.

REGULATION DE PRESSION DANS LES BOITES A GANTS. PURIFICATION D'ARGON. (Pressure Regulation in Glove-boxes. Argon Purification.) R. Pascard and R. Fabre. Mar. 1958. 12p.

Each dry box is equipped with an autonomous installation for circulation and purification of argon and for pressure regulation. This installation consists essentially of a ballast tank, a compressor, and two valves electromagnetically controlled by a contract manometer. The compressor and the valves are enclosed in the tank to form a system as compact as possible. The argon is purified by passing it over a furnace filled with titanium–zirconium turnings brought to about 800°C, branching off the main system. With this set-up, as well as the automatic maintenance of a constant depression in the box, a quality of argon is obtained whose oxygen contact is undetectable by the manganous hydroxide method. (auth)

8825 CEA-811

France. Commissariat à l'Énergie Atomique, Paris.

BOITES POUR MANIPULATION D'EMETTEURS β-ENERGIQUES. (Dry Boxes for Manipulation of High-energy β Emitters.) R. Boclet and H. Laurent. Mar. 1958. 13p.

Because of the thinness of latex on neoprene gloves and the high intensity of bremsstrahlung radiation, manipulation of pure high-energy β^- emitters is impossible in ordinary dry boxes. There are many types of boxes equipped with heavy lead or steel protection, but their use for radioelements such as P^{32}, Sr^{90}, or Y^{90} is not justified. Units known as "tong boxes" which, while retaining much of the flexibility of operation found in dry boxes, provide adequate protection were constructed. One curie of P^{32} placed in the center of the enclosure gives about 15 mr/8 h at the part of the wall closest to the source. (auth)

8826 HASL-51

New York Operations Office. Health and Safety Lab., AEC.

STRONTIUM PROGRAM QUARTERLY SUMMARY REPORT. Edward P. Hardy, Jr. and Stanley Klein. Nov. 19, 1958. 97p. $2.50(OTS).

Data are presented pertinent to the long-range monitoring of fall-out throughout the United States. Values are tabulated for radiostrontium activity in pot collections, precipitation collections, soil samples, surface air, high altitude air, tap water, liquid milk, and powdered milk obtained from various locations throughout the United States. (See also HASL-42.) (C.H.)

8827 NP-7282

Texas. Agricultural Experimental Station, College Station.

A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD. Progress Report X. [For] January 1, 1957 to September 1, 1957. L. R. Richardson. 20p. Contract DA-49-007-MD-582.

Final observations in the reproduction and longevity study indicated that approximately 500 litters and 3400 young were born to females each receiving an irradiated and a non-irradiated synthetic diet. Animals in both the reproduction and longevity study receiving the irradiated diet lived as long as those receiving the non-

irradiated. Animals receiving the irradiated diet consumed essentially the same amount of food as those receiving the non-irradiated. The incidence of gross abnormalities in the parent animals was low and it was no higher in the irradiated than in the non-irradiated groups. Females in the control groups weaned a slightly higher percent of young than females in the irradiated groups. The average weaning weight of the young in the control groups was 2 to 4 grams more than in the irradiated. The over-all incidence of blindness in young from mothers receiving the irradiated diet was 311% higher than in the controls. (For preceding period see NP-7279.) (auth)

8828 NYO-2274

Columbia Univ., New York. Radiological Research Lab.

ANNUAL REPORT ON RESEARCH PROJECT. July 1, 1958. 195p. Contract AT-30-1-GEN-70. $3.00(OTS).

Work was continued on dosimetric measurements of different types of ionizing radiation and the determination of related quantities of radiation. A tissue equivalent spherical proportional counter and associated apparatus were developed for use in measurements of the doses delivered by monoenergetic neutrons. A standard tissue equivalent gas ionization chamber was developed for use in the calibration of thimble chamber dosimeters in terms of absorbed dose in any tissue or material of interest. A lead paint containing 88% of finely powdered lead was developed to improve the shielding of existing low voltage machines without structural changes. Progress is reported in the following studies: the mechanism of spontaneous and radiation-induced mutations in E. coli; ionization measurement of the average beta-ray energy of iodine-131; factors inhibiting bacterial multiplication; differences in vitamin B_{12} binding capacity of normal and irradiated plasma; the effectiveness of cysteine ointment in the treatment of radiation injuries of the skin; studies on the aging process in which emphasis was placed on the relation between mortality rate and spontaneous mutation rate and on the effects of low-level chronic radiation exposure on the life span of mice; and studies on the pathological effects of ionizing radiations on the developing fetus. A list is included of publications during the period and papers in press. (For preceding period see NYO-2081.) (C.H.)

8829 RDB(W)/TN-146

Gt. Brit. Windscale Works, Sellafield, Cumb., England.

FURTHER EXPERIMENTS ON THE RAPID DETECTION OF PLUTONIUM DUSTS IN AIR. G. M. Wells. June 1954. 18p.

Air sampling in active and non-active areas, using a Casella cascade impactor, has confirmed that it is possible to separate plutonium from natural activity because of the larger particle size of the plutonium aerosol. A high flow rate impactor and a variable slit impactor were constructed and their performance compared with that of a standard filter paper. The preliminary results show that this method of plutonium detection is feasible for routine monitoring, and considerable improvements to both sharpness of cut-off and impaction effeciency should be possible by careful design. (auth)

8830 USNRDL-TR-289

Naval Radiological Defense Lab., San Francisco.

APPLICATION OF "THEORY FOR CLOSE-IN FALLOUT" TO LOW-YIELD LAND SURFACE AND UNDERGROUND NUCLEAR DETONATIONS. A. D. Anderson. Jan. 12, 1959. 66p.

A fallout-prediction method should be based on all the dynamics of the fall-out process, but current prediction models do not provide more than generalized answers because they do not account for early-time dynamics. A theory for close-in fallout has been derived in a recent attempt to account for the entire process. In this study, the new theory is checked by developing a mathematical fallout-prediction model. This model is used to predict fallout patterns from 3 low-yield (about 1 KT) nuclear weapons. These patterns are then compared with the measured test patterns and also with patterns calculated with 2 other prediction models. Based on these comparisons, it is concluded that the theory is valid, at least for low-yield land-surface and shallow-underground bursts. For underground bursts having a significant base surge, it is indicated that the model will have to be modified to take this effect into account before successful prediction can be expected. Since the basic fall-out phenomena associated with a land-surface burst of low yield are essentially the same as those for a high yield, it is now considered feasible to proceed with checking the theory for higher-yield land-surface bursts. Preliminary results indicate that the theory can be used to give successful predictions for shots in the moderate and high yield ranges. Accordingly, the model has been programed for an electronic computer for land-surface bursts through the 1-KT to 100-KT range of weapon yields. (auth)

8831

BERYLLIUM: HAZARD EVALUATION AND CONTROL IN RESEARCH AND DEVELOPMENT OPERATIONS. E. C. Hyatt, H. F. Schulte, R. N. Mitchell, and E. P. Tangman, Jr. (Los Alamos Scientific Lab., N. Mex.). Arch. Ind. Health 19, 211-20(1959) Feb.

A brief description of some of the various laboratory operations involving beryllium is presented along with sampling data which illustrate personnel exposure and control measures. It is concluded that with proper control measures the AEC-recommended standards can be met. Basic control measures consist of adequate exhaust hoods, respiratory protective equipment, and housekeeping comparable to the cleanliness of a food processing plant. (J.R.D.)

8832

IODINE-131 IN HUMAN THYROIDS AND IODINE-131 AND CAESIUM-137 IN MILK. P. R. J. Burch (Univ. of Leeds, Eng.). Nature 183, 515-17(1959) Feb. 21.

Following the announcement of the Windscale Reactor accident of Oct. 10, 1957, an apparatus was assembled to measure the trace uptake of iodine-131 in human thyroids and the concentration of iodine-131 and cesium-137 in milk. Data are tabulated covering a two-month period. Where the intake of iodine-131 from milk could be estimated, a close association with the uptake of iodine-131 in the thyroid was observed. (C.H.)

8833

INCREASE IN BACKGROUND GAMMA-RADIATION AND ITS CORRELATION WITH IODINE-131 IN MILK. F. W. Spiers (Univ. of Leeds, Eng.). Nature 183, 517-19(1959) Feb. 21.

Measurements were made of the γ-ray dose rate over a lawn and a house in Leeds during Aug. and Sept. 1957, and were repeated on Oct. 19, 1957 following the Windscale Reactor accident of Oct. 10. Small increases in dose rate were observed. The measurements were continued for several months. Data are tabulated. The relation of the radioactivity to the iodine-131 activity in milk from the area is discussed. (C.H.)

8834
STATISTICAL ANALYSIS OF REACTOR SAFETY STANDARDS. Ernest Siddall (Atomic Energy of Canada Ltd., Chalk River, Ontario, Can.). Nucleonics 17, No. 2, 64-9(1959) Feb.

For a more satisfactory approach to the analysis of reactor safety standards, a system is proposed whereby risks can be evaluated and efforts to meet them can be properly adjusted in magnitude. The equations are designed to decide how safe a system must be in view of both the cost of making it better and the damage that can result from failure. (J.H.M.)

8835
HANDLING CONTAMINATION IN SPENT-FUEL SHIELD WATER. W. H. Snavely and P. J. Manno (Continental Oil Co., Ponca City, Okla.). Nucleonics 17, No. 3, 121-3(1959) Mar.

Irradiation facilities using spent MTR fuel elements in water shields have a water contamination problem. It is shown that the contaminants are Sr^{90} and Zn^{65}. Means to control the contaminants are suggested which involve recirculation of the water through a small ion exchanger which is decontaminated frequently and through a larger exchanger cleaned every 6 months. (T.R.H.)

8836
BULLETIN OF THE ATMOSPHERIC RADIOACTIVITY. NUMBER 13 FOR APRIL-JUNE, 1958. Tokyo, The Japan Meteorological Agency, 1959. 98p. (In English and Japanese)

Data are tabulated on the radioactivity in rain and dust samples collected during April, May, and June 1958 at a network of stations throughout Japan. (C.H.)

INSTRUMENTS

8837 AERE-A/R-2756
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
A PENDULUM CONTROLLED RECORDING LEVEL. R. E. Clay. Dec. 1958. 8p. $0.25(BIS).

A pendulum whose movements are detected electrically is mounted on an adjustable support. Tilt of the foundation is compensated by negative mechanical feedback which restores the support to a zero position and operates a recording pen. (auth)

8838 AERE-EL/M-106
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
A TWIN-CORE HIGH-SPEED MAGNETIC STORAGE ELEMENT. E. Franklin. Jan. 1959. 6p.

A digital storage element is described in which two closely coupled magnetic cores are employed. One of the cores determines the saturation flux and the other core the minimum current for flux change. Separation of the two functions gives increased speed of operation. (auth)

8839 CERN-59-4
European Organization for Nuclear Research, Geneva.
SHOWER DETECTORS. Robert Hofstadter. Jan. 1959. 21p.

A high-energy sodium iodide scintillation counter is described. After passing through the sodium iodide crystal, the incoming radiation passes through a lucite coupling lens and enters the photomultiplier. This counter may be used to detect either electrons or gamma quanta incident on the port hole next to the crystal. (A.C.)

8840 CERN-Bib-2
European Organization for Nuclear Research, Geneva.
BUBBLE CHAMBERS. A Bibliography. Betty K. Ogden. 1959. 20p.

This bibliography includes 170 references from the report and published literature on bubble chambers. An author index is included. (J.E.D.)

8841 HW-54219
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PORTABLE IMPACT AIR SAMPLER. L. J. Defferding. Jan. 31, 1958. 9p. Contract W-31-109-Eng-52. $1.80 (ph), $1.80(mf) OTS.

The annular impactor was designed using a Staplex air sampler as the air mover. The sample is collected on a stainless steel sample dish coated with a benzene and silicone grease solution. The collection efficiency was determined by taking filter samples in series with the impactor. Comparison samples were collected with a filter in parallel with the impactor. The 40 cfm air flow makes it possible to detect the maximum permissible concentration (as defined by the RPS handbook) with a sampling time of 5 to 10 minutes. The collection efficiency for airborne plutonium and uranium contaminants is approximately 80% using a 10-minute sample time. The radon collection efficiency is 1% or less. After wide testing and collecting of samples under varied operating conditions, the impactor air sampler is approved for use in routine analysis of airborne alpha emitters. (auth)

8842 K-1292
Oak Ridge Gaseous Diffusion Plant, Tenn.
A SENSITIVE RATIO RECORDER FOR MASS SPECTROMETERS. W. G. Hart and A. Langdon. Mar. 18, 1959. 7p. Contract W-7405-Eng-26. $0.50(OTS).

A ratio recorder measuring system was developed for Oak Ridge Gaseous Diffusion Plant isotope ratio mass spectrometers. This measuring system uses many of the components of the galvanometer measuring system which it replaces. Improvements in both sensitivity and precision are achieved. Ratio recorders have been constructed and installed in twelve spectrometers. (auth)

8843 KAPL-M-DWJ-10
Knolls Atomic Power Lab., Schenectady, N. Y.
S3G PROJECT, SHIELD TEST INSTRUMENTATION. D. W. Johnson, R. J. Mazairz, and E. J. Romesberg. Jan. 19, 1959. 78p. Contract W-31-109-Eng-52. $12.30(ph), $4.50(mf) OTS.

A description of the instrumentation used in shield tests on the S3G plant is presented. The tests were performed to evaluate the shield in relation to the specifications and included measurement of fast neutron and gamma doses emerging from the shield and epithermal and thermal neutron fluxes. Each measuring system is considered along with methods of calibration. Typical calibration curves and instrument schematic diagrams are included. (J.R.D.)

8844 NP-7323
Nucledyne Corp., Chicago.
PROPOSAL FOR A LIQUID METAL HEAT TRANSFER LOOP. [nd]. 12p.

The design, fabrication, delivery, and installation of a liquid metal heat transfer loop for engineering laboratory

work are presented. The equipment is applicable to low melting point metals and their alloys. (W.L.H.)

8845 NP-7324
Nucledyne Corp., Chicago.
PROPOSAL FOR WATER HEAT TRANSFER LOOP. [nd]. 13p.

Specifications are given for the manufacture and installation of a water heat transfer loop. (W.L.H.)

8846 NP-7327
Nucledyne Corp., Chicago.
PROPOSAL FOR HOT LABORATORIES. [1957]. 11p.

A proposed general purpose hot laboratory for schools is described which is designed to give maximum personnel safety from exposure to an inhalation of radioactive materials. Argonne type master slave manipulators are specified for all designs in combination with high-purity zinc bromide windows. (A.C.)

8847 NYO-2387
Princeton Univ., N. J. Project Matterhorn.
A LIQUID NITROGEN LIQUID LEVEL CONTROLLER. Publication No. 17. Rodger Gamblin, Ernest Goldberg, and Dane T. Scag. Sept. 1958. 9p. Contract AT(30-1)-1238. $1.80(ph), $1.80(mf) OTS.

An electrically heated thermocouple is placed at the top and one at the bottom of a liquid nitrogen reservoir. The difference in temperature between the thermocouple immersed in the liquid and in the vapor phase is used to activate a filling system which maintains the meniscus between the top and bottom thermocouple. The operation of the circuit and results obtained from its use are described. (auth)

8848 NYO-7595
Rochester, N. Y. Univ.
A SIMPLE METHOD FOR GENERATING THE FUNCTION $1/1-\cos\theta$. Kurt Enslein. Apr. 24, 1956. 15p. Contract AT(30-1)-875. $3.30(ph), $2.40(mf) OTS.

A method for generating the function $1/1-\cos\theta$ for use in the operation of an analog computer is considered. A modification of the single-loaded potentiometer circuit gave the best results. The deviation for the 6 degree point was never greater than 2.7%, and the full-scale accuracy is much better. The errors are directly attributable to winding errors in the non-linear potentiometer. (J.R.D.)

8849 PB-131791
Naval Avionics Facility, Indianapolis.
SELECTED BIBLIOGRAPHY OF PRECISION INSTRUMENT AND FLUID BEARINGS WITH ANNOTATIONS. Materials Report No. 48. Joel G. Weir. Mar. 14, 1957. 104p. $2.50(OTS).

This bibliography is the result of an extensive survey of the entire field of precision instrument ball bearings and fluid bearings. The survey was made to evaluate the current state of the art as one phase of a bearing research program. The bibliography is intended to include all material pertinent to precision instrument ball bearings. The material included on jewel bearings is less complete. (auth)

8850 RAG-9
Reaktor A. G., Würenlingen, Switzerland.
MESURE ET DOSIMETRIE DES RAYONS GAMMA EMIS PAR LE REACTEUR A L'ARRET. (Measurement and Dosimetry of Gamma Radiations Emitted by the Reactor During Shut-Down.) A. Colomb, K. Haag, and G. Poretti. Nov. 1958. 31p.

Because of the practical utilization of gamma rays emitted by the reactor during shutdown, various measurements were made. Several types of dosimeters were tested, such as chemical dosimeters (chloroform, ferrous sulfate, and cerous sulfate), films of polyvinyl chloride, and glass dosimeters. The ranges of application as well as the standardization curves of these various types are given. (tr-auth)

8851 RDB(W)/TN-101
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
A GAMMA RADIATION ALARM. J. A. Mounsey. Sept. 1953. 10p.

A description is given of a monitor providing an audible warning of an increase in gamma intensity of 2 to 3 M.P.L's above a preset level. An adjustment allows this level to be selected between 0 and 10 M.P.L's. The alarm also indicates failure of the equipment or of the mains supply. A high-current Geiger counter measures the gamma intensity, the resultant current deenergizing a relay via a single stage amplifier and operating an alarm bell. (auth)

8852 SCTM-174-54(51)
Sandia Corp., Albuquerque, N. Mex.
THE RESPONSE CHARACTERISTICS OF AIRPLANE AND MISSILE PRESSURE MEASURING SYSTEMS. Harold Vaughn. Aug. 23, 1954. 20p. Contract [AT(29-1)-789]. $4.80(ph), $2.70(mf) OTS.

An empirical method for determining the response characteristics of pressure-measuring systems used in aircraft and missiles is presented. Both experimental and theoretical treatments are included. The method is more rigorous than the ordinary linear treatment usually used in the analysis of aircraft systems. The method is presented in such a manner as to be easily applicable to most pressure-measuring systems with greater than critical damping. (auth)

8853 SCTM-257-58(14)
Sandia Corp., Albuquerque, N. Mex.
IMPEDANCE OF A T-ANTENNA. Charles W. Harrison, Jr. July 7, 1958. 29p. Contract AT(29-1)-789. $4.80(ph), $2.70(mf) OTS.

A procedure is outlined for determining the driving-point impedance of a T-antenna with image. (J.E.D.)

8854 SCTM-457-58(14)
Sandia Corp., Albuquerque, N. Mex.
RESPONSE OF AN IMPEDANCE-LOADED ELECTRIC DIPOLE SYMMETRICALLY ORIENTED WITHIN AN IMPERFECTLY CONDUCTING CYLINDER—VLF CASE. Charles W. Harrison, Jr. Dec. 5, 1958. 17p. Contract AT(29-1)-789. $3.30(ph), $2.40(mf) OTS.

Analytical relationships are developed which permit calculation of the power in the load impedance of an electric probe, symmetrically located within an imperfectly conducting cylinder of small radius compared to the wavelength, in terms of the electric field incident upon the cylinder. (auth)

8855 WAPD-RM-190
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
A RUGGED BORON TRIFLUORIDE PROPORTIONAL COUNTER. O. F. Swift and Robert T. Bayard. July 2, 1953. 15p. $3.30(ph), $2.40(mf) OTS.

A boron trifluoride proportional counter, sufficiently rugged for industrial and military applications, is described. The counter has a sensitivity for thermal neutrons of approximately 4.5 counts per neutron cm^{-2} using a filling of 55 cm Hg of enriched BF_3. The counter

was found to remain usable in gamma fields as high as 230 roentgens per hour. In addition, the performance is not affected by ambient temperatures as high as 100°C. The preparation of the BF_3 and filling of the counters is also discussed. (auth)

8856 AEC-tr-3599
MOST RECENT SPECTRAL APPARATUSES OF THE U.S.S.R. V. K. Prokof'ev. Translated by A. L. Monks (Oak Ridge National Lab.) from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 22, 737-41(1958). 9p. $1.80(ph), $1.80(mf) JCL or LC.

A very brief explanation is given of the basic properties of a considerable number of spectral apparatuses developed in the USSR from 1955-57. In the new apparatuses diffraction lattices and replicas are used on a large scale; spectral apparatuses with photoelectric recording of the spectrum are being developed to a considerably greater extent than previously. (auth)

8857 CEA-tr-A-409
TUBES DÉCATION. COMPTEURS À REMPLISSAGE DE GAZ AVEC CATHODES SYMÉTRIQUES. (Decatron Tubes. Gas-filled Counters with Symmetric Cathodes.) M. Ernst and Karl Aschmoneit. Translated into French from Elektronik (Munich) 5, No. 11, 301-6(1956). 24p.

The principle of operation of the multicathode counter is described. The characteristics of the decatron, the shapes of the counting pulses, and the wiring are discussed. Tubes for counting and for command calculation are considered. (J.S.R.)

8858 CEA-tr-A-495
APPAREILS DE COMMANDE À DISTANCE POUR LA MANIPULATION DE MATÉRIAUX IRRADIES. (Remote-Control Apparatus for the Manipulation of Irradiated Materials.) J. Moll. Translated into French from Atomkernergie 2, 482-6(1957). 15p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 4304.

8859 CEA-tr-R-306
DÉTECTEUR EFFICACE DE NEUTRONS RAPIDES. (Efficient Detector of Fast Neutrons.) I. A. Akimov, A. S. Kouznetsov, and G. A. Leksine. Translated into French from Pribory i Tekh. Ekspt. No. 2, 70-1(1956). 6p.

The design and construction of a fast neutron detector are discussed. The detector consists of a copper container divided by thin plates of chromium–copper and filled with a scintillating liquid. The luminescent flashes are registered simultaneously by two photomultipliers connected in coincidence. The efficiency of the detector was evaluated experimentally and it was shown that the efficiency remains almost constant as a function of the neutron energy between 230 and 600Mev. (J.S R.)

8860 CEA-tr-R-571
MANOMETRE DE MAC-LEOD A TOMBAC. (McLeod Manometer of Tombac.) V. P. Pechkov and N. I. Kondratiev. Translated into French by B. de Trezvinsky from Pribory i Tekh. Ekspt. No. 4, 105(1957). 4p.

The construction of a McLeod manometer is proposed in which all the parts coming in contact with the mercury are of stainless steel, and tombac lines the upper plates of the compression chamber. (J.S.R.)

8861 CEA-tr-R-586
TUBES CATHODIQUES POUR L'ENREGISTREMENT DES PHÉNOMÈNES RAPIDES. (Cathode Tubes for the Recording of Rapid Phenomena.) V. I. Voznezenskii (Voznegenski), N. V. Korotkikh, A. S. Chernitzkii (Tchernitzki), and A. V. Koporskii (Koporski). Translated into French from Uspekhi Fiz. Nauk 62, 497-522 (1957). 57p.

In a brief survey of the developments of the last ten years in oscillographs, the basic methods of oscillography of rapid phenomena, as well as some characteristic problems of oscillographic tubes, are considered. 55 references. (J.S.R.)

8862 SCL-T-224
THE RELATION BETWEEN THE LENGTH OF A RADIO (IM)PULSE AND THE LENGTH OF A MODULATED (IM)PULSE IN AUTOMATIC VALVE GENERATORS. (Sootnoshenie Mezhdu Dlitel'nost'u Radioimpul'sa i Dlitel'nost'u Moduliruyushchego Impul'sa v Lampovykh Avtogeneratorakh.) N. I. Shtein. Translated by Marcel I. Weinreich (Sandia Corp.) from Nauch.-Issledovatel'. Inst. Gidromet. Priborostroen. No. 5, 138-44(1957). 18p. (Includes Original, 7p.) $3.30(ph), $2.40(mf) OTS.

The selection of modulated pulse length, in the presence of which it is possible to secure a given magnitude radio pulse length, is considered. Elimination of the fluctuation in front of a radio pulse can be attained by sub-excitation of the pulse generator. This may be done by means of a high-frequency voltage from a generator working in a continuous regime or by the sub-excitation from a constant or pulsed potential (pedestal pulse). Using the same methods, an automatic generator will produce radio pulses having a shorter duration than those produced without sub-excitation. The practical importance of radio pulse envelope front fluctuation is pointed out. (J.R.D.)

8863
EVALUATING HIGH-TEMPERATURE LIQUID PUMPS. A. F. Erwin. Allis-Chalmers Elec. Rev. 23, 3rd Qtr., 7-11(1958).

The liquid metal pump requirements for four major nuclear power reactor installations and two high-temperature liquid reactor plants are discussed. Details are given of: the two types of pumps for extensive testing as prototype primary and secondary coolant circulating units for the 75 Mw sodium-graphite reactor; the hermetically sealed and electromagnetic pumps selected for EBR-II; the mechanically sealed pumps selected for the 100 Mw Enrico Fermi breeder reactor plant; and the pumps considered for the LMFRE project; the 10 Mw SDR project for Alaska, and the 240 Mw molten-salt homogeneous-type reactor. (auth)

8864
A PRECISION CURVED CRYSTAL X-RAY AND GAMMA-RAY SPECTROMETER. Olof Beckman, Pär Bergvall, and Bertil Axelsson (Inst. of Physics, Uppsala). Arkiv Fysik 14, 419-37(1959).

A curved crystal spectrometer of the Du Mond type for precision measurements of x- and gamma-ray energies from 20 kev to 350 kev is described. The spectrometer utilizes a fixed source and a moving detector, the crystal being rotated and the Bragg angle measured with a precision angular scale. The advantages of this arrangement are discussed. An experimental comparison between two methods of bending the crystal lamina is made. The instrument is calibrated with the $K\alpha_1$ lines of Mo, Ag, Sb, and W. Measurements of U $K\alpha_1$ and a gamma transition in Pt^{194} (328.49 ± 0.05 kev) are reported. (auth)

8865

A COMBINED RING-BEAKER WELL SCINTILLATION DETECTOR FOR THE RAPID DETERMINATION OF RADIONUCLIDES EMITTING LOW SPECIFIC ACTIVITY GAMMA QUANTA. I. A. Pfau and H. C. Heinrich (Univ. of Hamburg and Max-Planck-Institutes für Tierzucht und Tierernährung, Marienese b. Hanover). Atompraxis 5, 14-21(1959) Jan. (In German)

With a measurement arrangement consisting of a ring-beaker and well-type scintillation counter enclosed in 10 cm of lead, and a counting device, it was possible to verify a constant zero effect for 24 hr with variations of $< \pm 1\%$, and to determine directly a Co^{60} borderline activity of 1.45×10^{-13} c/ml with $\pm 10\%$ average statistical margin of error in a counting time of 1 hr with a maximum beaker volume of 1500 ml by means of integral measurement. With a counting time of 238 min ~4 hr it was possible to include 7.5×10^{-14} c/ml under the same conditions. Higher Co^{60} activities, e.g. on the order of 1.5×10^{-12} c/ml, can be measured relatively rapidly in 9.8 min with $\pm$ 2.6% average statistical margin of error. Use of a pulse-height analyzer makes it possible to reduce the zero effect by a factor of 100 in integral determination, and to improve the efficiency in differential measurements of sample volumes up to 250 ml in comparison with the integral method. The output of the measurement arrangement described is shown when it is used for biological problems and also for routine diagnostic use of radioisotopes in medicine. The extreme sensitivity of the measurement arrangement makes it especially suitable for detecting radioactive contamination (incorporation of radioisotopes) in living organisms by means of excretion measurements. (auth)

8866

COUNTER TUBE WITH GREAT MEASUREMENT RANGE. (To P. Gossen & Co. GmbH., Erlangen, Ger.) German Patent DAS 1032 430. Atompraxis 5, 42(1959). (In German)

The counter tube consists of two counting systems with variable size of the cathode surface for high and low counting rates and of a counting wire common to both systems. It is a characteristic that the cathode of the system for a high counting rate is formed as a ring with a circular cross section. The cathode for the system of low counting capacity consists of a metal cylinder.

8867

NEW IONIZATION CHAMBER WITH GOOD GAIN AT DECREASED OPERATING VOLTAGE. (To Siemens-Reiniger-Werke AG, Erlangen, Ger.) German Patent DAS 1033 804. Atompraxis 5, 43(1959). (In German)

An ionization chamber is described which operates with decreased voltage, but the current yield is decreased and the radiation absorption is markedly increased. In an insulated space, two wall plates and two grid electrodes are placed. The wall plates on their inner surface support gold coatings which emit scattered electrons under x irradiation and serve also as electrodes. The electrodes are electrically connected with each other and with one pole of a direct current source. A measuring instrument indicates the ionization current.

8868

A NEW HD–H_2 MASS SPECTROMETER. Jacques Laplume. Inds. atomiques 2, No. 11-12, 36-40(1958). (In French)

A brief summary is given of the interest which the mass spectrometer has for chemical and isotopic analyses, and the operational principles are reviewed. The HD–H_2 mass spectrometer is described. This instrument permits the precise determination of hydrogen–deuterium mixtures. A collector with a double target allows the simultaneous measurement of the H_2 and the HD ion currents and the measurement of their ratio by a potentiometric method. (tr-auth)

8869

DISCRIMINATOR LOSSES IN PROTON-RECOIL FAST-NEUTRON DOSIMETERS. Iu. I. Petrov. J. Nuclear Energy 8, 244-6(1959) Jan.

The gamma radiation which usually accompanies a flux of fast neutrons makes it difficult to measure the fast neutron dose. Hurst has proposed a small tissue-equivalent chamber for this purpose which makes use of a great difference in ionizing power between Compton electrons and recoil protons. Small voltage pulses from the former are rejected by a discriminator, and the total ionization represented by the larger pulses from proton knock-ons is measured by a special pulse-amplitude integrator. A calculation of the integrator loss is given. (A.C.)

8870

DIRECTIONAL DETECTOR OF GAMMA RADIATION. D. Veron. J. phys. radium 19, Suppl., 129A-32A(1958) Dec. (In French)

A description is given of an apparatus designed to find the direction of a small source of gamma rays. It consists of two photomultipliers connected in coincidence and separated by a lead shield. (auth)

8871

NUCLEAR SPECTROMETRY BY PROPORTIONAL COUNTERS IN COINCIDENCE. G. Charpak and F. Suzor. J. phys. radium 19, Suppl., 167A-70A(1958) Dec. (In French)

A description is given of a proportional counter spectrometer specially adapted to the study of low-energy radiations (electrons or photons below 20 kev) emitted by radioactive atoms with very small probability. Two proportional counters of 18 cm diameter are in contact along a plane which contains the source holder. The source is in direct contact with the gas of one of the counters. Impulses of this counter in coincidence with impulses of the other are analyzed by a multichannel analyzer. The associated electronics is described with particular emphasis on the problems of nonoverloading qualities of the amplifiers. (auth)

8872

ISOTOPIC ANALYSIS OF LITHIUM BY MASS SPECTROMETRY. P. G. Bentley, J. Bishop, D. F. Davidson, and P. B. F. Evans (United Kingdom Atomic Energy Authority, Capenhurst, Chester, Eng.). J. Sci. Instr. 36, 32-4(1959) Jan.

A mass spectrometer has been built specially for the isotopic analysis of lithium. Conventional solid-source techniques are used, but the tube unit and electronic system have several novel features. Provision is made for pumping down two ion sources at once by having three arms in the mass spectrometer tube instead of the usual two; one arm takes the collector and the other two take ion sources, so that either source arm and the collector form a 60°-sector mass spectrometer. Each source arm is fitted with a vacuum lock to reduce pumping times. Measurements of the isotope ratio are made semi-automatically once ion beams are obtained. By scanning the magnetic field, each ion beam is brought alternately on to the collector, where it is amplified and

"remembered" as a voltage on a capacitor. The amplifier sensitivity is adjusted for one beam until the two voltages are equal, and the isotope ratio is read directly as the ratio of the amplifier sensitivities for the two ion beams. Fractionation effects in the ion source are described. The precision of measurement of the isotope ratio is 0.7% at the 95% confidence level, and the absolute accuracy of these measurements is thought to be better than 2%. The instrument is reliable and simple to use, and analyses can be made at the continuous rate of one every twenty minutes. (auth)

8873

LOW BACKGROUND GAS FLOW COUNTER. G. H. Bergold and G. R. Haney (Lab. of Insect Pathology, Sault Ste. Marie, Ont., Can.). J. Sci. Instr. 36, 39-44(1959) Jan.

A low background flow counter of comparatively simple construction, operating in the Geiger region, is described. The sample counter is shielded by mercury and surrounded by an anticoincidence ring of eighteen overlapping counters, a top counter, and lead and mercury shields. The counting efficiency with 1 in. diameter steel planchets is 62% for low energy β particles such as C^{14}; the background is 1.040 ± 0.005 counts/min; and the limit of sensitivity is 0.025 counts/min. (auth)

8874

NUCLEAR SPIN PULSE APPARATUS. K. Luszczynski and J. G. Powles (Univ. of London). J. Sci. Instr. 36, 57-63(1959) Feb.

A detailed description including circuits and operating instructions, is given for the construction of a nuclear spin pulse apparatus which will measure nuclear spin-lattice relaxation times from 500 μs upwards and nuclear spin-spin relaxation times from 20 μs upwards over the temperature range -180 to 220°C with an accuracy of better than $\pm 5\%$. An Appendix lists where all published circuit diagrams and technical data suitable for spin echo apparatus may be found. (auth)

8875

SCINTILLATING PROBE WITH CHANGEABLE SCINTILLATORS FOR DETECTION OF ALPHA, BETA, AND GAMMA RADIATION. J. Šilar. Jaderna Energie 5, 21-4(1959). (In Czech.)

Designs, connection schemes, and principal characteristics of scintillation probes for detecting alpha, beta, and gamma radiation are given. (tr-auth)

8876

ALUMINIUM PROPORTIONAL COUNTER FOR THE MEASUREMENT OF LOW FAST NEUTRON FLUX. R. N. Glover (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Instr. 3, 316-19(1958) Dec.

A simple aluminum-walled proportional counter has been developed to measure low fast neutron flux by irradiation of the counter itself and subsequent counting of the β rays from the 9.8 min Mg^{27} activity produced by the (n,p) reaction. The operational characteristics are described and the sensitivity discussed. The counter is capable of detecting a fast neutron flux $\approx 10^3$ n·cm^{-2}·sec^{-1}. (auth)

8877

PHOTOFISSION IN FISSION CHAMBERS. R. N. Glover (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Instr. 3, 320-2(1958) Dec.

During shielding measurements in water on LIDO a large discrepancy was observed between fast neutron flux measurements with fission chambers and those using activation techniques. This effect is shown to be due to photofission of the fissionable material in the chambers. (auth)

8878

MULTIPLE FAST COINCIDENCE UNIT. Kristian Skarsvåg (Univ. of Liverpool). Nuclear Instr. 3, 336-40(1958) Dec.

A fast diode coincidence unit which can be driven by photomultiplier pulses is described. The coincidence circuit can be changed from a double to a triple or quadruple by a switch. A resolving time, τ, of about 3 mμsec with 100% efficiency can be achieved. The dead time following non-coincident and coincident input pulses are about 16 and 70 mμsec, respectively. (auth)

8879

HIGH SPEED COUNTER CHRONOMETER. A. M. Hillas and R. M. Tennent (Univ. of Leeds, Eng.). Nuclear Instr. 3, 344-9(1958) Dec.

A counter chronometer is described which measures time intervals up to 12.75 microseconds by counting the oscillations of a 20 Mc/s free-running oscillator with a scaler. Provision is made for resetting the scaler by a fast pulse if the measurement is not to be recorded. The scaler is based on conventional pentodes and germanium diodes, the high counting speed being attained by limiting voltage changes. (auth)

8880

CHARGE-STORAGE PULSE-HEIGHT ANALYZERS FOR USE WITH PULSED ACCELERATORS. L. Costrell and R. E. Brueckmann (National Bureau of Standards, Washington). Nuclear Instr. 3, 350-8(1958) Dec.

Storage type pulse-height analyzers for use with low duty cycle pulsed accelerators are discussed and an analyzer described that accommodates up to nine pulses in a single burst with a resolution of two microseconds. The pulses to be analyzed are temporarily stored as lines of charge on the face of a cathode ray tube and are analyzed by means of an electron beam that detects the charge discontinuity at the peak of the pulse. The pulse-height information is then permanently stored in a magnetic core memory. (auth)

8881

A NUCLEAR METHOD FOR DETERMINING VERY LOW VAPOR PRESSURES. Mostafa F. Amr El-Sayed (Florida State Univ., Tallahassee). Nuclear Instr. 3, 359-60(1958) Dec.

A method is proposed for measuring very low vapor pressures of tritium-labeled compounds by counting with a silver-walled gas proportional counter. The apparatus, principle of the method, and its advantages and disadvantages are discussed. (T.R.H.)

8882

ARE PLATEAUS SIGNIFICANT IN SCINTILLATION COUNTING? Ralph W. Engstrom and J. L. Weaver (RCA, Lancaster, Penna.). Nucleonics 17, No. 2, 70, 72, 74(1959) Feb.

Plateau characteristics of gas-filled and scintillation counters are discussed, and considerations are given to the derivation of plateau curves and their interpretation. It is significant that a long plateau provides latitude in both voltage setting and the drifts in power supply and photomultiplier sensitivity. Since photomultiplier gain changes during tube life, any plateau-length requirement for scintillation counters should be judged by the amount of change in gain that can be tolerated. Scintillation counting plateaus depend on crystal size, radiation

source, and background scattering as well as the counting performances of photomultipliers. (J.H.M.)

8883

CONTINUOUS AIR MONITOR FOR H^3. J. Brinkerhoff, C. A. Ziegler, R. Bersin, and D. J. Chleck (Tracerlab Inc., Waltham, Mass.). Nucleonics 17, No. 2, 76, 78, 81(1959) Feb.

The design and theory of operation of a continuous monitor that uses a flow-type ionization chamber are discussed. The instrument is capable of accurately indicating tritium concentrations of 0.1 to 100 times the maximum permissible concentration [2×10^{-6} $\mu c/cm^3$] with an estimated error over the range not exceeding ± 5%. The monitor can be adopted to measure radioactive gases other than tritium. It can also be used as a sampler for particulate airborne material. It is possible to monitor large objects for surface contamination by inserting them into the hold volume. (J.H.M.)

8884

LOGARITHMIC-AMPLIFIER PERIOD METER. A. Pearson (Atomic Energy of Canada, Ltd., Chalk River, Ont., Can.) and Y. J. Fokkinga (Sperry Gyroscope Co. of Canada, Ltd., St. Laurent, Quebec). Nucleonics 17, No. 2, 82, 84, 86, 88(1959) Feb.

A logarithmic device is described that can be used for the following applications: monitoring log power and log rate during reactor startup without range switching; reactor control during part of the startup cycle for reactors with automatic startup and, if made linear in the reactor operating range, control in that range; gamma monitoring if combined with a suitable ion chamber; and service as a simple reactor simulator if modified to obtain the antilogarithm of an input. The instrument is completely transistorized except for one vacuum tube serving as the logarithmic element. An electromechanical servo loop provides an isolated logarithmic output signal, and a tachometer linked to the servo-motor provides a log-rate or period signal. (J.H.M.)

8885

A METHOD FOR ESTIMATING BETA-COUNTING EFFICIENCIES. B. P. Bayhurst and R. J. Prestwood (Los Alamos Scientific Lab., N. Mex.). Nucleonics 17, No. 3, 82-5(1959) Mar.

A method is proposed for estimating beta-counting efficiency which uses an experimentally determined relation between counting efficiency and average particle energy. It can be applied to any stable beta-counting system by using a calibrating procedure which is outlined. The method can be used to calculate beta-counting efficiencies of nuclides difficult to prepare with sufficient purity or specific activity for absolute counting by the usual means. It would also be useful in studies requiring a large number of efficiency determinations. The method eliminates the necessity for making separate corrections for self-absorption, backscattering, or self-focusing. (T.R.H.)

8886

MULTIPLEX PULSE-HEIGHT-ANALYZER SYSTEM. Almon E. Larsh, Jr. (Univ. of California, Berkeley). Nucleonics 17, No. 3, 92, 94(1959) Mar.

A multiplex pulse-height-analyzer system is described in which a single multichannel analyzer analyzes and a recorder records spectra simultaneously from several detectors. In this system the amplified detector signals are split and part sent to a coder and part to a mixer-amplifier. The mixer-amplifier output is fed to a pulse-height analyzer and thence to a recorder. A simultaneous code signal designates the detector originating the pulse. Where time coincidence is important, time is also recorded. The system was used in discovery of element-102. (T.R.H.)

8887

ION CHAMBER CAN DETECT NUCLEATE BOILING. L. R. Boyd (General Electric Co., San Jose, Calif.). Nucleonics 17, No. 3, 96 98, 100, 102(1959) Mar.

In-pile and other experiments prove the feasibility of using neutron-sensitive ion chambers to detect nucleate boiling in a reactor core. The ion chamber is placed in the region of the reactor core most likely to boil. Voids in the water moderator caused by boiling decrease the moderation and thus cause fluctuations in the thermal-neutron flux. The a-c component of the ion-chamber signal then corresponds to the magnitude of bubble formation and thus indicates the intensity of boiling. (auth)

8888

HEAT-BALANCE FLOWMETER FOR MOLTEN BISMUTH. Donald W. Huszagh (Brookhaven National Lab., Upton, N. Y.). Nucleonics 17, No. 3, 114-15(1959) Mar.

Modernization of a heat-balance flowmeter for use in a loop circulating molten Bi is described. (T.R.H.)

8889

TRANSISTORIZED NUCLEAR RESONANCE MAGNETIC FIELD PROBE. J. R. Singer and S. D. Johnson (Univ. of California, Berkeley). Rev. Sci. Instr. 30, 92-3 (1959) Feb.

A transistorized marginal oscillator type of nuclear resonance probe is described. The main advantages of transistor use are in obtaining portability, eliminating external power sources, and low cost. The sensitivity and stability equaled that of a standard transitron vacuum tube circuit when compared using protons in water. (auth)

8890

EFFICIENT PRECISION CURRENT REGULATOR FOR HIGH-POWER MAGNETS. R. L. Garwin (IBM Watson Lab. and Columbia Univ., New York) and D. Hutchinson, S. Penman, and G. Shapiro (Columbia Univ., New York). Rev. Sci. Instr. 30, 105-7(1959) Feb.

Using paralleled power transistors driven by a transistor and a chopper amplifier, supplemented by a coarse feedback loop to the generator field, the field of an electromagnet requiring 80 amp at 200 v was regulated to < 0.001%. The dissipation in the regulator is 250 w. The magnet current may be varied from zero to maximum by setting the reference potentiometer to the appropriate voltage, and sufficient protective measures are incorporated so that the circuit is not injured by misuse. The circuit is usable to perhaps a megawatt. (auth)

8891

HIGH-CURRENT ION SOURCE. Russell G. Meyerand, Jr. and Sanborn C. Brown (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 30, 110-11(1959) Feb.

A high-current ion source is described that is of simple design and construction. It is capable of producing an ion beam of ½ amp. The energy spread of the ions is large. (auth)

8892

CARBON-14 RESPIRATION PATTERN ANALYZER FOR CLINICAL STUDIES. Bert M. Tolbert, Martha Kirk,

and Frank Upham (Univ. of California, Berkeley). Rev. Sci. Instr. 30, 116-20(1959) Feb.

A description of an instrument for measuring C^{14}, percent CO_2, and C^{14} specific activity in the breath of human subjects is presented. Ionization chamber assay for the C^{14} is used. The design parameters of radioactivity sensitivity and response time are discussed. For simple carbon-14 metabolites some 1 to 10 μc are required for an eight-hour respiration analysis with this instrument. (auth)

8893
ADIABATIC CALORIMETER FOR METALS IN THE RANGE 50 TO 1000°C. E. E. Stansbury, D. L. McElroy, M. L. Picklesimer, G. E. Elder, and R. E. Pawel (Univ. of Tennessee, Knoxville). Rev. Sci. Instr. 30, 121-6(1959) Feb.

An adiabatic calorimeter designed primarily for measurements on bulk metal samples is described. Details of the calorimeter design and operation are given. Experimental problems associated with precise high-temperature measurements are emphasized. Measurements from room temperature to 1000°C were made and include determinations of specific heats, heats of transformation, and heats of solution. Representative data on pure nickel are shown with reported accuracy of ±0.5%. (auth)

8894
MAGNETIC RECORDING OF PULSE-AMPLITUDE DATA. James Baumgardner (Argonne National Lab., Lemont, Ill.). Rev. Sci. Instr. 30, 134-5(1959) Feb.

Cavanagh and Boyce have shown that the recording of nuclear pulses on magnetic tape can be of significant value in experiments in physics. The development and performance of a tape recorder which gave line widths of about 1% for pulse-amplitude data are described. (A.C.)

8895
CRYSTAL FILTER TO PRODUCE PURE THERMAL NEUTRON BEAMS FROM REACTORS. B. N. Brockhouse (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Rev. Sci. Instr. 30, 136-7(1959) Feb.

A neutron filter is described which preferentially passes neutrons of low energy and which can thus be used to produce beams of thermal neutrons which are comparatively free from fast neutrons. The device is in use at the NRX reactor. (A.C.)

8896
SCINTILLATION COUNTER EFFICIENCY MEASUREMENT. Stirling A. Colgate (Univ. of California, Livermore). Rev. Sci. Instr. 30, 140-1(1959) Feb.

A method for making scintillation counter efficiency measurements in a few minutes to an accuracy of 10% is outlined. (D.E.B.)

8897
DOSIMETER FOR MEASURING THE DOSE FROM A FLAT SOURCE. E. A. Liberman (Inst. of Roentgenology and Radiology). Vestnik Rentgenol. i Radiol. 32, No. 6, 61-6(1957). (In Russian)

A luminescence dosimeter with an improved resolving power and capable of measuring β radiation in layers of arbitrary thickness was designed for use in medical laboratories. (R.V.J.)

8898
ČERENKOV RADIATION AND ITS APPLICATIONS. J. V. Jelley. New York, Pergamon Press, 1958. 310p. $10.00

The first four chapters of this volume describe the theoretical interpretation, extension to the theory, and later experimental work on Cherenkov radiation. The next four chapters discuss the photomultiplier, Cherenkov detectors and their applications, optical considerations of counters, and the designs of some practical counters. The last two chapters discuss Cherenkov radiation in the atmosphere and gas counters. (W.L.H.)

METALLURGY AND CERAMICS

Refer also to abstracts 9436, 9439, 9441, 9444, 9446, 9447, 9449, 9450, 9453, 9454, and 9467.

8899 ACR-12
Office of Naval Research, Washington, D. C.
TECHNOLOGY OF MOLYBDENUM AND ITS ALLOYS. Symposium [held at] Detroit, September 18-19, 1956. 20p. (PB-131793). $0.75(OTS).

Abstracts of papers presented at a symposium on the technology of molybdenum and its alloys are presented. Presentations were made on preparation and fabrication, arc casting, working, and joining of the metal and its alloys. In addition, the ductile-to-brittle transition in Mo was examined as well as the effects of C, O, and N on ductility. Powder metallurgy of Mo and its alloys was discussed, and some of the properties of arc-cast alloys are given. Aspects of Mo alloy application to gas turbines were considered with the emphasis on design consideration, protection from high-temperature oxidation, turbine bucket forging, and the effects of hot-cold work on the properties of the alloys. (J.R.D.)

8900 AD-75224
Illinois Inst. of Tech., Chicago.
REVIEW OF SELECTED PAPERS RELATING TO NEW STRUCTURAL MATERIALS DEVELOPED BY POWDER METALLURGY. Literature Survey Report No. 4. Feb. 25, 1955. 29p. I.I.T. Project No. 6078. Contract NOrd-13883.

A review of selected papers relating to structural materials developed by powder metallurgy is presented. Reviews on theoretical considerations of high-temperature materials are presented, as well as developmental aspects of high-temperature materials produced by powder metallurgy and powder product treatments for property improvement. 15 papers. (J.R.D.)

8901 AD-75225
Illinois Inst. of Tech., Chicago.
LITERATURE SURVEY REPORT NO. 3. Continuation of PART I of LITERATURE SURVEY ON THE DIFFUSION OF METALS INTO OXIDES. PART II. LITERATURE SURVEY ON NEW STRUCTURAL MATERIALS MADE BY POWDER METALLURGY PROCESS FOR ELEVATED TEMPERATURE SERVICE. Aug. 25, 1954. 25p. I.I.T. Project No. 6078. Contract NOrd-13883.

A literature survey on the diffusion of metals into oxides and on structural materials made by powder metallurgy processes is presented. 219 references. (J.R.D.)

8902 AD-201386
British Columbia Research Council, Vancouver.
KINETICS OF FORMATION OF ANODIC OXIDE FILMS ON ZIRCONIUM. L. Young. [1958]. 27p.

A new method, involving spectrophotometric identification of the thickness, was used to study the kinetics.

Zirconium was found to differ from tantalum and niobium in that the field strength, calculated assuming that the full thickness acts as a barrier to ionic movement, increases very markedly with increasing thickness of oxide at constant ionic current density. The experimental results definitely indicate that the activation energy and the "half jump distance" increase with thickness and temperature. The latter result agrees with that found by Willis, Adams, and van Rysselberghe. Some caution is necessary in interpreting the experimental results, because the field strength tends to depend on the previous history of the film, and because capacity measurements show some peculiarities, e.g., the effective dielectric constant varies with the thickness of oxide. Unlike tantalum, there appears to be no overshoot in the field strength when the current is suddenly changed. These results suggest that zirconium might well fit the model suggested by Dewald as applying to tantalum (and now thought not to apply). This model postulates space charge due only to mobile metal ions, which results in a transition between control by the entrance barrier and control by the diffusion barriers in the film itself. A condition tends to occur in which the field may be as much as 30% lower than expected by extrapolation from higher current densities or lower temperatures. This condition is favored by low currents, high temperatures, greater thicknesses, and Na_2SO_4 rather than H_2SO_4 solution. It may be due to oxygen ion movement, which, unlike metal ion movement, is facilitated if pores or cracks are present. Prior formation at high current densities tends to eliminate the effect during subsequent formation at low current densities. A sequence of formations in descending decade steps of current density was, therefore, used in the kinetic studies. (auth)

8903 AECD-4276

Los Alamos Scientific Lab., N. Mex.

A CORRELATION OF THE MAGNETIC SUSCEPTIBILITIES OF THORIUM, URANIUM, AND PLUTONIUM WITH CRYSTAL STRUCTURE. A. Allen Comstock. July 22, 1953. Decl. Feb. 6, 1959. 37p. Contract [W-7405-eng-36]. $6.30(ph), $3.00(mf) OTS.

A general description of an attempt to correlate the magnetic susceptibilities of thorium, plutonium, and uranium with their crystal structures using Neel's semi-empirical method is presented. The physical formulation of the wave function problem, numerical method of determining the wave functions, and the results of numerical calculations are considered. (J.E.D.)

8904 AECU-4040

Syracuse Univ., N. Y. Metallurgical Research Labs.

RELATIONS GOVERNING LOW CYCLE FATIGUE—A SUMMARY OF THE PERTINENT LITERATURE. Interim Technical Report No. 1. G. Sachs and A. P. Taber. May 15, 1958. 72p. Contract AT(30-1)-2141. $12.30(ph), $4.50(mf) OTS.

The information available to date on low-cycle fatigue, resulting from either repeated mechanical straining (strain cycling) or from repeated temperature changes under restraint (thermal cycling and thermal shock), their relation to static and conventional fatigue properties, and their fundamental significance is assembled. In spite of the small amount of data accumulated on the effects of the numerous variables involved in low-cycle fatigue, these data appear to conform to certain significant relations between conventional ductility and the number of cycles to failure obtained in the low-cycle range up to about 10,000 cycles. (auth)

8905 AFOSR-TN-58-1061

California. Univ., Berkeley. Minerals Research Lab.

THE EFFECT OF IMPURITIES AND HEAT TREATMENT ON THE DUCTILITY OF *MgO*. Technical Report No. 2. A. E. Gorum, W. J. Luhman, and J. A. Pask. Dec. 1958. 20p. Contract AF49(638)-56. (AD-207221).

Very small amounts of impurity can greatly affect the strength and ductility of magnesium oxide. It appears that the impurity may move to and from the dislocations, moving away during heating and collecting again during cooling if the rate is slow enough. The dislocations are effectively pinned and the more dislocations present in the structure, the greater the effect on the strength and ductility. (auth)

8906 AGARD-158

North Atlantic Treaty Organization, Paris. Advisory Group for Aeronautical Research and Development.

SOME FUNDAMENTAL FEATURES OF MECHANO-CHEMICAL ATTACK ON METALS. T. P. Hoar. Nov. 1957. 8p.

Presented at the Sixth Meeting of the Structures and Materials Panel, held November 4-8, 1957, Paris.

The behavior of oxide films under conditions leading to their chemical failure, and under fretting, fatigue, and static stress conditions, is discussed. Disarrayed surface zones in a metal surface lead to the formation of less effective oxide films and also, in de-filmed metal, to rapid chemical attack. The consequent effects produced under fretting corrosion, corrosion-fatigue and stress-corrosion conditions are considered. Recent experimental work indicates that metal that is yielding under mechanical stress is in an especially active chemical state. The implications of this work on the mechanism of stress-corrosion cracking are considered. (auth)

8907 BMI-1312

Battelle Memorial Inst., Columbus, Ohio.

GAS-PRESSURE BONDING OF FLAT-PLATE FUEL ASSEMBLIES. Stan J. Paprocki, Edwin S. Hodge, Charles B. Boyer, and Ralph W. Getz. Jan. 20, 1959. 51p. Contract W-7405-eng-92. $1.50(OTS).

Subscale flat-plate fuel subassemblies measuring up to 2 by 2 by 20 in., incorporating 16 Zircaloy-2-clad uranium—zirconium fuel plates and 15 coolant channels, were successfully fabricated by the gas-pressure-bonding process. Autoclave design, specimen-container configuration, and the design and preparation of specimen components were among the problems studied. Uneven heating of the bonding specimen, caused in part by convective heat transfer, was minimized by developing a special four-element muffle-type resistance heater for the autoclave and by filling void space between the specimen and heater with copper plates and sand. With this arrangement there was only a 10 to 15°F variation over a 36-in. zone at 1500°F. A type 304 stainless specimen container design, resembling in cross section a swastika, allowed distortion-free bonding of specimens without supplementary jigging. The practicality of building up an entire assembly from simple, rectangular pieces was demonstrated. This technique makes it easier to maintain the close dimensional tolerances required for fabrication of flat-plate assemblies and eliminates the expensive machining required to produce one-piece picture frames. Flat Ti-Namel stock inserted between the Zircaloy-2-clad fuel plates during assembly of the components was removed after bonding was completed by acid etching to form the coolant channels. Chromium plating the Ti-

Namel prevented reaction with the Zircaloy-2. In studies of surface preparation, it was found that removing 2 to 3 mils of surface by machine belt abrading of the components with 60-grit SiC produced consistent bonding. Bonding of the assemblies at 1550°F for 4 hr under a helium pressure of 10,000 psi produced excellent results. (auth)

8908 BMI-1313
Battelle Memorial Inst., Columbus, Ohio.
FURTHER STUDIES OF SINTERED REFRACTORY URANIUM COMPOUNDS. Arch B. Tripler, Jr., M. Jack Snyder, and Winston H. Duckworth. Jan. 27, 1959. 55p. Contract W-7405-eng-92. $1.75(OTS).

The refractory uranium compounds UC and UC_2 were prepared by arc-melting methods, UN by gas-solid reactions, and UB_2 and UBe_{13} by solid-solid reactions. Techniques for sintering powder compacts of these compounds to densities 90% of theoretical or greater were developed. Mean linear thermal-expansion coefficients of 7.9×10^{-6} per °F for UC and 9.3×10^{-6} per °F for UBe_{13} were obtained in the range 68 to 1800°F. The thermal conductivity of sintered UBe_{13} increased from 0.050 cal/(sec)(cm)(C) at 100°C to 0.064 cal/(sec)(cm)(C) at 650°C. The electrical resistivity of sintered UBe_{13} was 113 microhm-cm at 27.6°C. Knoop microhardness values varied from 500 for sintered UC_2 to 1155 for sintered UBe_{13}. Sintered UC and UC_2 decompose rapidly in boiling (atmospheric pressure) water. A sintered UBe_{13} compact lost 2.2 mg per cm^2 (average), after 72 hr in boiling water (atmospheric pressure). UC_2 reacts more rapidly with nitrogen and oxygen than does pure uranium. UB_2 and UBe_{13} were less reactive with oxygen and nitrogen than is pure uranium. The heat of formation of UC was -20 ± 5 kcal per mole at 25°C. Standard free-energy-of-formation equations were estimated for UN, USi_2, US, UB_2, UC_2, and UC. (auth)

8909 BMI-1317
Battelle Memorial Inst., Columbus, Ohio.
OXIDATION AND CONTAMINATION REACTIONS OF NIOBIUM AND NIOBIUM ALLOYS. William D. Klopp, Daniel J. Maykuth, Chester T. Sims, and Robert I. Jaffee. Feb. 3, 1959. 79p. Contract W-7405-eng-92. $2.25(OTS).

Niobium was found to react linearly with air (600 to 1200°C) and with oxygen (400 to 1400°C). At 1400°C, a very rapid reaction with oxygen was observed. Contamination hardening during oxidation was attributed to diffusion of oxygen into the metal from the predominantly Nb_2O_5 scale. Alloying effects could be correlated with relative ionic size and valence of the alloy addition and with properties of the alloy-element oxides. Additions with smaller ionic size or higher valence improved oxidation behavior up to 15 at. % alloying. These additions included chromium, molybdenum, tungsten, and vanadium. Size effects predominated over valence effects. At alloying levels greater than 15 at. % elements having solid stable oxides, such as titanium and zirconium, improved the oxidation behavior. Elements with volatile oxides, such as molybdenum, rhenium, and vanadium, decreased the oxidation resistance when added in amounts greater than 15 at. %. The most effective binary additions for improving oxidation resistance were chromium, molybdenum, titanium, and vanadium. A molybdenum–chromium alloy oxidized about 20% slower than the best binary alloy. The degree of improvement for the best alloys over unalloyed niobium ranged from a hundredfold at 600°C to sixfold at 1200°C. The most effective additions were concluded to be those which form solid stable oxides of their own or which are capable of forming complex oxides such as spinels. (auth)

8910 BMI-1319
Battelle Memorial Inst., Columbus, Ohio.
POSTIRRADIATION EXAMINATION AND EVALUATION OF AN OMRE FUEL ASSEMBLY. Richard J. Burian and John E. Gates. Feb. 11, 1959. 69p. Contract W-7405-ENG-92. $2.25(OTS).

A fuel-element assembly from the first loading of the OMRE was examined in detail after experiencing an average uranium burnup of between 1 and 2 at. %. The rate of decay heat generation was evaluated by temperature monitoring of the shipping-cask coolant. Temperatures of the fuel-element-box assembly and the fuel plates were measured with thermocouples and tempilstiks. Structurally, the fuel-element assembly was affected very little by either radiation or the organic coolant-moderator. Although there was some distortion in the side and end plates of the assembly, the coolant channels between the fuel plates were free from major fouling and obstructions. The channel cross sections were reduced at specific points less than 5 per cent. The plates studied were subjected to complete gamma scanning. Specimens removed from selected areas of the scanned plates were radiochemically analyzed for burnup and the results correlated with the gamma-scan data. Burnup profiles were constructed for each of the scanned plates. The gamma-scan data were also utilized to determine the average plate burnup. (auth)

8911 BMI-1321
Battelle Memorial Inst., Columbus, Ohio.
ALUMINA-CLAD UO_2 FOR FUEL APPLICATIONS. Allison K. Smalley, William C. Riley, and Winston H. Duckworth. Feb. 18, 1959. 8p. Contract W-7405-eng-92. $0.50(OTS).

Using a special reactive form of high-purity alumina, claddings were applied to UO_2 particles by a tumbling technique. The clad pellets were isostatically pressed at 100,000 psi and then sintered at 2800°F in hydrogen. Crack-free spheroidal pellets ranging from 1000 to 2000 μ in diameter were produced. The dense Al_2O_3 envelopes surrounding the UO_2 particles were estimated to be 300 to 500 μ thick. The Al_2O_3 claddings protected the UO_2 from oxidation when the pellets were heated in air for 100 hr at 1200 or 1800°F. There was no measurable release of fission products from irradiated clad particles heat treated at 1700°F in vacuum for 7 days after exposure to 6.0×10^{12} nv for 1 hr at room temperature. Claddings of other oxides, such as BeO or MgO, probably could be applied by the same techniques used in applying the Al_2O_3 claddings. (auth)

8912 BRB-46
Bridgeport Brass Co., Conn.
EFFECT OF TRANSFER TIME ON THE RECRYSTALLIZATION BEHAVIOR OF BETA-COOLED URANIUM. Q. C. Carloni and L. Lewis. Jan. 12, 1959. 36p. $6.30(ph), $3.00(mf) OTS.

A study was made of the recrystallization behavior of beta-quenched uranium by incorporating the effects of transfer time from the beta heat-treating bath to the quench media. A critical transfer time which relates to the time required to immerse samples at a temperature above the beta-alpha transformation in a quench media directly affects the beta-cooled structure and its ease of recrystallization upon alpha phase annealing. Within the

critical transfer time, the ease of recrystallization and degree of grain refinement of beta-cooled samples as measured by alpha-phase annealing temperatures and times are superior to samples quenched beyond the critical transfer time. (auth)

8913 BW-5425
Babcock and Wilcox Co. Research Center, Alliance, Ohio.
THERMAL SHOCK AND FATIGUE TEST OF A THREE INCH PIPE. John A. Speeds. Feb. 9, 1955. 24p. For Westinghouse Electric Corp. Atomic Power Div. Subcontract 73-14-391. $4.80(ph), $2.70(mf) OTS.

The pipe specimen was connected to a corrosion loop circulating 600°F water at 2500 psi, and electricity was passed through the specimen to simulate gamma heating. Two thousand heating cycles were carried out with the inside wall at 600°F and the outside wall cycling from 600 to 676.3°F, after which the pipe was examined visually and microscopically. (W.D.M.)

8914 CEA-815
France. Commissariat à l'Énergie Atomique, Paris.
DÉPOT ELECTROLYTIQUE DE NICKEL SUR L'URANIUM. (Electrolytic Nickel Deposits upon Uranium.) G. Baudin, G. Chauvin, H. Coriou, and J. Hure. Oct. 1957. 18p.

A new possibility for the protection of uranium by adherent nickel deposits, obtained by electrolysis in aqueous solution, is presented. The surface treatment of uranium is based on the Lietazke chemical etching method. After thermal treatment at 600, 700, and 800°C under vacuum, a good Ni–U intermetallic diffusion was obtained in all cases. (auth)

8915 CEA-833
France. Commissariat à l'Énergie Atomique, Paris.
FRITTAGE DE L'OXYDE DE BERYLLIUM À 3 ET 5 POUR CENT DE BORE ELEMENT. (Sintering of Beryllium Oxide With 3 to 5 Per Cent Elemental Boron.) R. Pointud, Ch. Rispal, and M. Le Garec. May 1958. 14p.

In order to fabricate a screen absorber for neutrons of various energies, a mixture of a moderator and an absorber was obtained by hot pressing a powder containing technical-grade beryllium oxide and boron carbide. The compact obtained is a briquette of 100 × 100 × 50 mm, machined on all surfaces, with a density of 2.85 and a porosity of 3 to 4% for a boron content of 5%. The heterogeneity of the boron between different points of the briquette is less than 10%. (tr-auth)

8916 CRFD-810
Atomic Energy of Canada Ltd., Chalk River, Ont.
THE IRRADIATION OF ALUMINUM–PLUTONIUM ALLOYS IN ZIRCALOY SHEATHING. PART I. PRELIMINARY EXPERIMENTS WITH ALUMINUM–URANIUM ALLOYS. T. I. Jones. Dec. 1958. 24p. (AECL-735). $1.00(AECL).

Aluminum–uranium alloys containing up to 20 wt. % uranium were studied in a stand-in capacity as a prelude to a program of work with aluminum–plutonium alloys clad in Zircaloy-2. The object of the investigation was to examine the effect of temperature on the structure and hardness of the core alloys, their interaction with Zircaloy-2 at various temperatures, and their corrosion properties in high-temperature water. Diffusion bonds were formed between Zircaloy-2 and aluminum–10 wt. % uranium alloy by heating at 600°C for 1 hour. However, the large difference in expansion co-efficients caused failure of the bonds during cooling. Heating at immediately above the solidus temperature (640°C) of the core alloys caused rapid sheath dissolution, sheath integrity being maintained for only a few hours. Hypo-eutectic alloys possessed good resistance to water at 340°C (~0.004" penetration in 2 hours) whereas exfoliation 0.040 to 0.080" deep occurred with the hyper-eutectic alloys. Aluminum–10 wt. % uranium alloys, canned with defected Zircaloy-2 sheathing, was as resistant to corrosion in water at 340°C as the corresponding bare alloy. (auth)

8917 DANATOM-02-58
Danish Assn. for Industrial Development of Atomic Energy, Hellerup.
ALUMINIUMLEGERINGER SOM BYGGE-MATERIALER TIL REAKTORER. (Aluminum Alloys as Building Material for Reactors.) Aage Jensen. [1958]. 11p.

The composition of various American, English, German, and Danish aluminum alloys used for reactor construction is compared. (J.S.R.)

8918 DMIC-Memo-5
Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
THE INFLUENCE OF SHEET THICKNESS ON TENSILE PROPERTIES OF METAL SHEET. Alfred Rudnick and Robert L. Carlson. Jan. 23, 1959. 19p.

A review of the literature on the effect of specimen geometry indicates that the percentage total elongation increases as some power of the product of specimen thickness and width. Thus, it is possible to combine the effects of thickness and width into a single parameter, cross-sectional area. No significant influence of thickness on strength apparently exists. Consideration of the correlation between laboratory measurements and actual useful ductility leads to the conclusion that uniform elongation may be a more significant index of ductility than is the more commonly used total elongation. (auth)

8919 DMIC-Memo-6
Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
THE STATUS OF CHROMIUM-BASE ALLOY DEVELOPMENT. Jan. 30, 1959. Daniel J. Maykuth. 8p.

A considerable amount of information is available concerning the binary phase relations between chromium and many metals. This is apparent from the data, which summarizes the state of knowledge of the binary phase relationships and physical properties of 36 elements with chromium. The elements selected represent all of the known metals which have melting points higher than 1200°F and which have boiling points in excess of 3407°F, the melting point of pure chromium. On this basis, these 36 elements are likely to include all metals of potential interest as alloying additions to chromium to improve its high-temperature properties. (auth)

8920 IGR-TN/C-1015
United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
INVESTIGATION OF CRACKS IN AN 18/13/1 STAINLESS-STEEL AUTOCLAVE. F. Turner and H. K. Richardson. 1958. 11p.

A stainless steel autoclave used in the corrosion testing of metals in water failed by stress corrosion in the vicinity of a weld. Welding had been by metallic arc using flux-coated electrodes and a slag deposit was found at the weld root in the failed area. The flux and resultant slag deposit were proved to contain significant amounts of chloride. The slag deposit was con-

nected with the autoclave interior via the interface between the base plug and wall. This provided the corroding medium which in the presence of water and residual plus operating stresses caused failure by stress-corrosion cracking. Recommendations are made for the avoidance of this type of failure. (auth)

8921 JPL-EP-583
California Inst. of Tech., Pasadena. Jet Propulsion Lab.
HIGH-TEMPERATURE SHORT-TIME CREEP OF GRAPHITE. H. E. Martens, L. D. Jaffe, and D. D. Button. Nov. 13, 1958. 52p. Contract DA-04-495-Ord-18.

Constant-load tensile creep properties of four commercial grades of synthetic graphite were determined at 3000 to 5300°F for periods of up to 8 hr. The specimens tested had a gage section of ¼-in. diameter by 1-in. length and are heated in helium by an external graphite heater. Creep rates of 10^{-7} to 10^{-3} sec^{-1} are observed at stresses of 1600 to 4000 lb/in^2. The creep rate increased continuously with increasing temperature and did not show a minimum corresponding to the peak found in the tensile strength at approximately 4500°F. The creep rate was lower when stress was applied parallel rather than perpendicular to the grain. Total elongations greater than 5% caused decreases in density. Elongations up to 40% and density decreases up to 18% occurred during tensile creep testing. For one grade of extruded graphite, plastic Poisson ratios of 0.18 for the stress perpendicular to the grain and 0.12 for the stress parallel to the grain were found. Activation energies of 170 to 240 kcal/mol are obtained using the rate-process-theory expression, $\epsilon = Ae^{-\Delta H/RT}$, and the time-compensated-temperature expression $T(C + \log t) = \text{constant}$. For some test procedures, values as low as 130 kcal/mol were found. (auth)

8922 LMSD-2423
Lockheed Aircraft Corp. Missile Systems Div., Sunnyvale, Calif.
BRUSH BERYLLIUM QMV MATERIAL: DYNAMIC MODULUS OF ELASTICITY AND RUPTURE MODULUS AT ROOM TEMPERATURE. Jay F. Burcham. May 23, 1958. 29p. Contract Nord-17017.

The methods and results of an investigation to determine the dynamic modulus of elasticity, Young's modulus of elasticity, and the rupture modulus of Brush beryllium QMV block material at room temperature are presented. The dynamic modulus of elasticity was obtained by both a beam vibration and a wave propagation method. A beam deflection method was used to substantiate that the test material does not have a significant proportional limit and consequently has no Young's modulus. Bending of a simply supported beam was used to determine the rupture modulus. The general results obtained were in close agreement with anticipated properties based on earlier tensile and compressive tests. (auth)

8923 MAB-137-M
National Research Council. Materials Advisory Board.
UNIFORM BEND TEST EVALUATION TECHNIQUES. [Jan. 1959]. 11p.

Bend test procedures are outlined for the titanium alloy sheet rolling program. (W.L.H.)

8924 MND-MPR-1580
Martin Co. Nuclear Div., Baltimore.
ZERO POWER TEST MANUFACTURING REPORT. Dec. 1958. 37p. Contract AT(30-3)-277. $6.30(ph), $3.00(mf) OTS.

All phases of fabrication of 2,247 highly enriched stainless steel–uranium dioxide (stainless steel clad) fuel tubes are described. The necessary testing of as-received materials is discussed. Weighing, blending, and forming of the fuel compacts and the subsequent densification, machining, and forming of the fuel core are described. The surface preparation of the assembly parts and the wall reduction and heat treatments necessary to obtain recrystallization bond of the component parts are also included. Process scrap, testing, chemical analysis, and quality control are discussed. (W.D.M.)

8925 NAA-SR-Memo-3463
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
REDISTRIBUTION OF A SOLUTE SPECIES UNDER A TEMPERATURE GRADIENT IN A BINARY ALLOY. A. W. Sommer. Jan. 14, 1959. 11p. $3.30(ph), $2.40 (mf) OTS.

This program will be divided into three phases. Phase one and two of the program will be concerned with the measurement of solute redistribution in a solution where the solute species has an appreciable vapor pressure above the solution (zirconium hydride) in the investigated temperature range. Phase three will deal with the measurement of Q profiles in alloys where the solute species has no appreciable vapor pressure over the solution. (W.L.H.)

8926 NGTE-R-226
Gt. Brit. National Gas Turbine Establishment, Farnborough, Hants, England.
TRANSIENT THERMAL STRESSES PROMOTED BY THE RAPID HEATING AND COOLING OF BRITTLE CIRCULAR CYLINDERS. E. Glenny and M. G. Royston. June 23, 1958. 47p.

The validity of the theory for calculating transient thermal stresses in brittle circular cylinders produced by rapid heating and cooling was tested by experiment, using a high alumina ceramic and hot and cold fluidized beds as the heating and cooling media. The agreement between theory and experiment is reasonable in the light of the nonstatistical nature of the experiments, and of the assumptions involved in developing and using the theory, and in correlating the thermal stress to failure with breaking strength. (auth)

8927 NLCO-759
National Lead Co. of Ohio. Cincinnati.
LABORATORY EVALUATION OF GRAPHITE CRUCIBLE COATINGS FOR VACUUM MELTING URANIUM. Orville R. Magoteaux, Delmer L. Elston, and Charles F. Hall. Oct. 24, 1958. 40p. Contract AT(30-1)-1156. $1.25(OTS).

Oxide and carbide coatings and methods of applying them to graphite crucibles were evaluated on a laboratory scale. The objectives were to find a better crucible and mold coating than magnesia (MgO), which is currently used in the remelt operation, and a better method of application than brushing. The evaluation consisted of the vacuum-melting of slug uranium charges and derby uranium "as reduced" charges in graphite crucibles having different coatings, followed by studies of the appearance of the coatings and the metal quality (impurity levels) of the products. Flame-sprayed magnesium zirconate ($MgZrO_3$) was determined to be the best coating

evaluated. It limited the average carbon pickup to 73 ppm for derby uranium charges; with slug uranium, no pickup occurred. The flame-spray method provided a uniform coating thickness and virtually eliminated moisture and volatiles in the coatings. Studies showed that the flame-sprayed magnesium zirconate contains a very small amount of volatiles and is not hygroscopic, but that 2500°F it is reduced slightly by graphite and CO is released. (auth)

8928 NLCO-768
National Lead Co. of Ohio. Cincinnati.
CONTROL OF CARBON PICKUP IN URANIUM METAL BY INDUCTION FURNACE TUNING. J. W. Mahaffey. July 31, 1958. 12p. Contract AT(30-1)-1156.

Induction furnaces were investigated to determine which physical or electrical characteristics affect carbon pickup in the melting step. A method of tuning the induction furnace coils was developed which reduced the number of rejects and lowered the over-all level of carbon. (auth)

8929 NMI-1136
Nuclear Metals, Inc., Cambridge, Mass.
METALLURGICAL ASPECTS OF THE CORROSION RESISTANCE OF ZIRCONIUM. David S. Kneppel. Aug. 1, 1955. 23p. $4.80(ph), $2.70(mf) OTS.

The presence of massive particles of precipitated zirconium compounds of iron or nickel was shown to cause decreased corrosion resistance in 680°F water. Quenching zirconium from the beta region also resulted in decreased corrosion resistance possibly due to strained metal. Nickel was the most effective inhibitor for this type of corrosion. The corrosion resistance of the ternary alloys studied was less sensitive to the effect of heat treatment than were the binary alloys. In the case of the Fe–Sn–Zr alloys, some dependence on heat treatment was found; no such dependence was observed for Ni–Sn–Zr alloy. (auth)

8930 NMI-4368
Nuclear Metals, Inc., Concord, Mass.
POWER REACTOR PROGRAM. Progress Report to E. I. du Pont de Nemours and Company for the Period July 6, 1958 through July 31, 1958. F. S. Gardner, S. Isserow, R. G. Jenkins, J. Johnston, D. F. Kaufman, A. Lumbert, and W. J. Richmond. Oct. 16, 1958. 15p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $3.30(ph), $2.40(mf) OTS.

Processing of the recently extruded lot of nine prototype U–2 wt. % Zr alloy tubes was completed to the point of heat treatment. Experimental work is underway to improve the understanding of the factors affecting the corrosion behavior of Zircaloy-2 clad tubular fuel elements after initiation of cladding failure exposing the core to water. (For preceding period see NMI-4366.) (W.D.M.)

8931 NMI-4369
Nuclear Metals, Inc., Concord, Mass.
POWER REACTOR PROGRAM. Progress Report to E. I. du Pont de Nemours and Company for the Period August 1, 1958 through August 31, 1958. F. S. Gardner, D. F. Kaufman, R. G. Jenkins, J. H. Johnston, S. Isserow, P. Loewenstein, and W. J. Richmond. Nov. 5, 1958. 20p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $3.30(ph), $2.40(mf) OTS.

A satisfactory technique was found for support of full-size tubes during diffusion heat treatment. As part of the program on cost reduction and quality improvement, 11 model tubes were evaluated with disclosure of several significant conclusions on fabrication changes which may be applicable in full-size power tubes. In experiments on corrosion behavior, it is apparent that variations may occur between tubes which presumably have identical histories. Paper studies on the fabrication of enriched driver tubes are reported. (For preceding period see NMI-4368.) (W.D.M.)

8932 NMI-4381
Nuclear Metals, Inc., Concord, Mass.
POWER REACTOR PROGRAM. Progress Report to E. I. du Pont de Nemours and Company for the Period September 1, 1958 through September 30, 1958. F. S. Gardner, D. F. Kaufman, R. G. Jenkins, J. H. Johnston, S. Isserow, A. R. Kaufmann, P. Loewenstein, A. M. Huntress, and W. J. Richmond. Feb. 2, 1959. 13p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $3.30(ph), $2.40(mf) OTS.

Three prototype tubes were diffusion heat treated, and no significant deformation of the cladding was indicated. Casting of U–2 wt. % Zr alloy into Zircaloy sleeves was experimentally investigated. Planning in advanced fuel element design now encompasses a twisted ribbon element and a cladding alloy suitable for operation in steam at 900°F. (For preceding period see NMI-4369.) (W.D.M.)

8933 NMI-4382
Nuclear Metals, Inc., Concord, Mass.
POWER REACTOR PROGRAM. Progress Report to E. I. du Pont de Nemours and Company for the Period October 1, 1958 through October 31, 1958. F. S. Gardner, D. F. Kaufman, R. G. Jenkins, W. J. Richmond, P. Loewenstein, A. M. Huntress, W. L. Larson, and S. Isserow. Feb. 2, 1959. 18p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $3.30(ph), $2.40(mf) OTS.

The post-extrusion processing of the U–Zr tubes for irradiation in NRU was continued. Production of the enriched prototype tubes for Vallecitos is proceeding satisfactorily. A cost reduction evaluation for shortening the front and rear Zircaloy end seal tube sections is under way. The reasons for different corrosion results in heat-treated tubes tested under simulated reactor shutdown conditions were investigated. (For preceding period see NMI-4381.) (W.D.M.)

8934 NMI-4385
Nuclear Metals, Inc., Concord, Mass.
POWER REACTOR PROGRAM. Progress Report to E. I. du Pont de Nemours and Company for the Period January 1, 1959 through January 31, 1959. F. S. Gardner, W. J. Richmond, W. L. Larson, A. M. Huntress, A. R. Kaufmann, D. F. Kaufman, R. G. Jenkins, A. R. Lumbert, P. Loewenstein, J. P. Pemsler, and S. Isserow. Feb. 26, 1959. 35p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $6.30(ph), $3.00(mf) OTS.

Processing, fabricating, and testing of reactor fuel tubes are described. Comparative costs for extruding and cupping of Zircaloy-2 are given along with a complete fabricating procedure for this process change. Improvement of nondestructive testing apparatus for clad thickness was directed to existing equipment including standards, resolution, and temperature characteristics. A short 800°C heat treatment for Zircaloy-2 clad U–2 wt. % Zr tubes is being studied as an economical replacement of the diffusion heat treatment. Develop-

mental melting of 90.6 wt. % Zr–U alloy for casting into cores for driver tube extrusion billets included trials of vacuum induction melting in graphite and one arc melt by the consumable electrode process. The coextruded flat ribbon of Zircaloy-2 clad U–2 wt. % Zr alloy was sectioned and examined for clad thickness along the extrusion length and around the perimeter at several locations. Irradiation behavior of the U–Zr alloy is being studied. (See also NMI-4382.) (W.D.M.)

8935 NP-7195
Frankford Arsenal. Pitman-Dunn Lab., Philadelphia.
THE HAE PROCESS FOR MAGNESIUM: RECOMMENDED PRACTICE–INSTALLATION, OPERATION AND CONTROL DETAILS; PHYSICAL CHARACTERISTICS OF THE HAE COATING. Third Revised Edition. Harry A. Evangelides. Feb. 1958. 59p.

A summary of the technique of magnesium alloy preparation and treatment by the HAE process is presented. The equipment necessary for the installation of the process is described, as well as the operating procedure and bath control. Coating characteristics are given, and an outline of recent process development is discussed. Military specification for coating magnesium alloy is included as well as data on the process and methods of bath analysis. (J.R.D.)

8936 NP-7252
MSA Research Corp., Callery, Penna.
PROGRESS REPORT NO. 50 FOR DECEMBER 1958 AND JANUARY 1959. W. J. Posey, ed. Feb. 16, 1959. 21p. Contract NObs-77023.

Film boiling runs made in tubes containing water showed considerable axial variation around the heat exchanger. Heat balance at low NaK flows was off by about 30%. Loop modifications were made, and tests will continue. Studies of chloride stress corrosion on stainless steel and Inconel pipe were conducted. The stainless steel stress corroded in one to four days depending on thermal cycling temperature. No coating was found which would provide extended protection. Coating with water glass prevented cracking in one 100-hour cycling test. Inconel did not stress corrode; however, pitting occurred in a 5-week thermal cycling test. Seventeen protective coatings were tested, four of which appeared to offer the best protection. These include coating 9 (Mn base), coating 5 (Ni base), coating 10 (Al base), and coating 6 (Zn base). (For preceding period see NP-7101.) (J.R.D.)

8937 NP-7260
Massachusetts Inst. of Tech., Cambridge.
ECONOMIC COMPARISON OF ZIRCALOY AND STAINLESS STEEL IN NUCLEAR POWER REACTORS. Summary Report. Manson Benedict. Feb. 6, 1958. 35p. For Columbia-National Corp.

Also available in Italian in Energia nucleare (Milan) 5, 493-508(1958).

Use of zirconium (as Zircaloy) instead of less expensive stainless steel as structural material, fuel cladding, or fuel diluent in nuclear reactors makes savings possible through the use of uranium of lower enrichment and/or through reduction in the critical mass of uranium. Columbia-National has made a study of the relative economics of using Zircaloy versus stainless steel in five power-producing thermal reactors, chosen so as to span the entire range of fuel enrichment from natural to highly-enriched uranium. Break-even prices of Zircaloy were computed for each reactor, i.e., the price at which, with an annual return on capital investment of 15%, the lower cost of uranium inventory is just balanced by the difference in cost between Zircaloy and stainless steel. (auth)

8938 NRL-5278
Naval Research Lab., Washington, D. C.
A REMOTELY CONTROLLED DROP-WEIGHT TEST MACHINE FOR BRITTLE-FRACTURE STUDIES. L. E. Steele and J. R. Hawthorne. Jan. 16, 1959. 8p.

In order to study the effects of nuclear radiation on the notch-impact properties of large steel specimens, remotely controlled drop-weight test equipment has been designed for use in a hot-cell facility. The drop-weight test has been used to define the control temperature below which steel structures may potentially initiate brittle fractures in the presence of sharp notches or flaws. The test is to be applied for the determination of embrittlement due to radiation. Irradiated specimens to be tested are thermally conditioned in insulated environmental chambers, then positioned on the machine where a free-falling weight delivers a fixed amount of energy to the specimen to determine the relative resistance to fracture. The weight is coupled electromagnetically and lifted by a remotely operated ratiomotor to a height which is predetermined by means of seven microswitches located at one-foot intervals. All phases of this testing operation are accomplished remotely by pneumatic or electrical means, with the exception of specimen placement which is accomplished by use of the master-slave manipulators. (auth)

8939 NYO-2325
Southwest Research Inst., San Antonio.
MATERIALS PROPERTIES RESEARCH REQUIRED FOR THE RATIONAL DESIGN OF PRESSURE VESSELS IN NUCLEAR REACTORS. Final Report. L. U. Rastrelli. Dec. 1, 1958. 98p. Project No. 774-2. Contract AT(30-1)-2146. $24.30(ph), $7.50(mf) OTS.

Some of the pressure vessel design procedures which depend on material properties are reviewed, and those areas where materials behavior information is needed for more rational design are identified. Experimental materials data are classified into load, temperature, and frequencies categories. Some of the existing material characteristic theories which tend to depict the concept of cumulative damage and dynamic creep in engineering materials are reviewed. Specific experimental and analytical pressure vessel materials research programs felt to be necessary are indicated. (W.D.M.)

8940 ORNL-2612
Oak Ridge National Lab., Tenn.
THE INERT-GAS-SHIELDED METAL-ARC WELDING OF TITANIUM. E. A. Franco-Ferreira and P. Patriarca. Mar. 17, 1959. 58p. Contract W-7405-eng-26. $1.75 (OTS).

A program was initiated to study the inert-gas-shielded metal-arc welding of titanium. The basic incentive for this work was provided by the possibility of remotely repairing the leak in the Homogeneous Reactor Test core tank. The body of the program consisted mainly of developing welding procedures for the single-pass full-penetration square butt welding of ¼-in.-thick titanium plates in the downhand position. It was expected that the results would be applied similarly to the welding of Zircaloy-2. Successful welding procedures were developed. The results were consistent, and various tests affirmed the excellent quality of the welds. (auth)

8941 ORNL-2701
Oak Ridge National Lab., Tenn.
THE REACTION AND GROWTH OF URANIUM DIOXIDE–ALUMINUM FUEL PLATES AND COMPACTS (thesis). Roger Conant Waugh. Mar. 23, 1959. 69p. Contract W-7405-eng-26. $2.00(OTS).
Submitted to the University of Tennessee.

The reaction of dispersed UO_2 in an aluminum matrix in pressed compacts and fuel plates was studied at 500 to 600°C. Correlation of reaction with the accompanying volume increases was made and a growth mechanism proposed. Reaction rates and products are given as functions of UO_2 concentration, temperature, and time. (W.D.M.)

8942 RDB(C)/TN-22
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE CREEP OF URANIUM. A Review of Progress to December 19, 1952. M. J. Makin and G. Willoughby. Mar. 19, 1953. 13p.

Progress in the program of work on the creep of uranium during the period March to December 1952 is described. A short investigation was made into the tensile strength and creep properties of cast uranium when heated beyond the beta-gamma transformation temperature of 775°C. The work was undertaken to obtain preliminary information on test materials and methods which might also be of value in reactor design. The ultimate tensile strength in the temperature range 780 to 900°C has been shown to be approximately 300 psi. In creep tests of up to 10 hours duration at 900°C, creep strains of 0.01 in. per in. occurred under stresses as low as 15 psi. Special testing devices are clearly required to carry out tests on material of such low strength, and descriptions are given of recent designs to meet this need. The projected program or research into the mechanism of the deformation of uranium in its various crystalline phases is outlined. (auth)

8943 RDB(C)/TN-23
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE POWDER COMPACTING OF URANIUM COMPOUNDS. A Review of Progress to December 15, 1952. G. D. Bell and E. Proudfoot. Mar. 6, 1953. 15p.

The cold pressing and sintering characteristics of uranium tetrafluoride have been investigated. Sintering has been carried out in various atmospheres and for varying temperatures and times. Densities of compacts ranging from 3.8 to 6.2 gm/cc have been produced in an argon atmosphere. Results obtained with uranium dioxide have confirmed the figures reported previously by other workers. (auth)

8944 RDB(C)/TN-25
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE EFFECTS OF VARIOUS CONTAMINANTS ON THE CORROSION OF 18/13/1 CHROMIUM–NICKEL STEEL IN BOILING 70% NITRIC ACID. A Review of Progress from September 1, 1952 to February 1, 1953. H. N. Jones. Apr. 15, 1953. 9p.

Additions of chromate ions cause a large increase in the corrosion rate of chromium–nickel steels in boiling 70% nitric acid. To elucidate the mechanism of this acceleration and to discover any other ions which might have a similar effect, a general investigation has been commenced. The effect on corrosion of a number of contaminating ions added to boiling 70% nitric acid was studied. Test specimens were prepared from 18/13/1 steel. Vanadium is a powerful accelerator of corrosion, and a smaller effect is caused by cerium and molybdenum. Tungsten only slightly increases the corrosion rate, and cobalt appears to have no effect. (auth)

8945 RDB(C)/TN-27
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE CORROSION OF 18/13/1 STEEL UNDER CONDITIONS SIMULATING THOSE IN THE HIGHLY ACTIVE LIQUOR EVAPORATORS AT WINDSCALE. H. N. Jones. Apr. 21, 1953. 10p.

Corrosion tests on 18/13/1 steel have been carried out under conditions which may be expected in the two-stage low-pressure effluent evaporator plant to be erected at Windscale. Two sets of tests were made, in one of which conditions were similar to those in the proposed 4/1 evaporator, while the other simulated the 13/1 evaporator. Corrosion rates for each type of evaporator were investigated at 70, 80, and 100°C. Very low rates of attack were recorded. Under the conditions of the 4/1 evaporator, the highest rate was 0.012 mm/year, at 100°C. At lower temperatures corrosion rapidly decreased. For the 13/1 evaporator the corrosion rate was 0.034 mm/year at 100°C, but dropped to 0.005 mm/year at 70°C. (auth)

8946 RDB(C)/TN-29
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
BULGING TEST ON A FAST REACTOR FUEL ELEMENT. D. S. Oliver. Apr. 29, 1953. 17p. (FRDC/p-16).

A fast reactor fuel element, canned in Nimonic with an interlayer of zirconium between the uranium and the can, was heated to 1150°C. Failure of the element by chemical attack occurred at this temperature. There was no sign of any dimensional change in the element as a result of the heating. (auth)

8947 RDB(C)/TN-39
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE ELECTROLYSIS OF USED URANIUM SALTS. R. Lind and W. G. O'Driscoll. May 8, 1953. Decl. Nov. 20, 1957. 16p.

The electrolytic reduction of UF_4 was investigated in fused melts of NaCl and $CaCl_2$ or KF. Electrolysis produced metallic uranium at the cathode in the form of powders set in a mass of fused salts. It was found impossible to separate these powders from the melt without oxidation taking place to UO_2, and it was concluded that the process was unlikely to furnish an efficient method of production of uranium. (auth)

8948 RDB(C)/TN-44
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
FUNDAMENTAL STUDY OF THE CORROSION OF 18/13/1 CHROMIUM NICKEL STEEL IN NITRIC ACID. A Review of Progress to February 1, 1953. H. N. Jones. June 15, 1953. 17p.

A study has been commenced to determine the mechanism of corrosive attack by boiling 70% nitric acid on 18/13/1 steel. It has been established that attack initially takes place at crystal boundaries, and the metallographic evidence so far obtained suggests the presence at some boundaries of a phase which encourages attack. Attempts to identify such a phase, which could only be present in minute proportion, have so far been unsuccessful. It has also been shown that heat treatment of the steel affects crystal boundary attack. By heat treating at 1050 to 1100°C, followed by rapid cooling, boundary attack was reduced to a minimum. Up to 24 hours the time at temperature had little effect. It is recommended that a series of 18/13 alloys containing varying amounts of

columbium carbide be prepared, so that the effect of changes in the columbium carbide content of the steel may be studied in relation to boundary attack. It is also suggested that an electro-chemical study be made of the behavior of niobium carbide coupled to 18/13 austenitic steel, in nitric acid solution. (auth)

8949 RDB(C)/TN-75
Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
THE INFLUENCE OF VARIOUS IONS ON THE RATE OF CORROSION OF 18% Cr, 13% Ni, Nb STABILISED AUSTENITIC STEEL IN 70% W/W NITRIC ACID. T. E. Evans and H. N. Jones. June 21, 1954. 19p.

The influence of certain ions containing cerium, vanadium, molybdenum, and thorium on the rate of corrosion in nitric acid of 18% Cr, 13% Ni, niobium stabilized austenitic steel has been determined. The results, together with those obtained previously in this investigation, are reviewed, and an explanation is advanced to account for the observed differences in the extent to which different ions accelerate corrosion. It is suggested that the mechanism of accelerated corrosion is governed by cathodic depolarization, and the effect of different ions is discussed in terms of the redox potentials of the probable reactions involved at the cathodes. The role played by nitric acid is also discussed. (auth)

8950 RDB(C)/TN-110
United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
INVESTIGATION OF REFRACTORIES FOR USE IN THE EXTRACTION OF HIGH MELTING POINT METALS. P. Best and E. Proudfoot. Jan. 24, 1955. 17p.

Calcined dolomite has been used for the calcium reduction of vanadium trioxide and thorium tetrachloride. Its disadvantages are impurities in the natural material ease of hydration. The effect of zirconia additions to calcium oxide on the rate of hydration has been studied, and a comparison made between the thermal shock resistance of calcium zirconate and other refractories used for bomb linings. (auth)

8951 RDB(C)/TN-112
United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
A REVIEW OF POSSIBLE METHODS FOR REFINING THE AS-CAST STRUCTURE OF URANIUM. P. G. England. Feb. 11, 1955. 18p.

The production of fine-grained, randomly orientated as-cast uranium is of great interest since reduction of growth and distortion could be expected if such material were used in a pile. A survey is made of the methods used to obtain refinement with other metals, and the theories proposed to account for the phenomena are considered. The application of similar techniques to uranium is discussed, and an experimental program is recommended. (auth)

8952 RDB(C)/TN-133
United Kingdom Atomic Energy Authority. Industrial Group. Culcheth Labs., Culcheth, Lancs, England.
ARC MELTING OF REFRACTORY METALS. A Review of Progress from October 10, 1954 to April 4, 1955. H. N. Jones. July 27, 1955. 16p.

Experiments in the ingot melting furnace indicate that the size range of the charge must be carefully controlled. Neither fine powders nor large pellets can be accommodated. It is concluded that pellets of about $\frac{1}{8}$-in. diam. would be ideal. Complexities introduced by this requirement, plus the greater probability of achieving vacuum arc melting, make attractive the alternative of using a consumable electrode. Both the electron bombardment furnace and the Mark III small arc furnace are nearly complete. An argon purification plant has been constructed and is working successfully. Use of the purified argon leads to a reduction of about 25% in the hardness of argon arc melted niobium. (auth)

8953 RDB(S)/TN-2049
Gt. Brit. Springfields Works, Springfields, Lancs, England.
THE MICROSCOPIC EXAMINATION OF CALCIUM FLUORIDE SLAGS. D. I. Dagg. Dec. 1952. 24p.

An examination of two representative CaF_2 slag samples Nos. 500 and 500A was made under the microscope in order to ascertain the nature and distribution of the uranium present. Slag from sample No. 500 was found to consist of discrete uraniferous inclusions widely distributed in a CaF_2 matrix, while slag from sample No. 500A was thought to consist mainly of a solid solution of UO_2 and CaF_2. A study of the fluorescent properties of the slag under ultraviolet radiation and an autoradiographic study were made to help confirm previous observations, but the results depended not only on the uranium content, but also on the form in which the uranium was present. An attempt to follow the leaching action of sulfuric and nitric acids was also made. Some inclusions were found to lie along definite crystallographic planes, and were attacked by nitric acid causing disintegration. Although sulfuric acid also caused disintegration, the exact mechanism of this was not evident. In both cases, not all the inclusions were attacked, and the particles which were thought to consist of a solid solution of UO_2 in CaF_2 were unaffected thus explaining the limited efficiency of recovery of the uranium. (auth)

8954 RDB(W)/TN-52
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
SOLDERING TECHNIQUES FOR MAKING DISSIMILAR METAL JOINTS BETWEEN ALUMINIUM, STAINLESS STEEL AND BRASS. D. Shaw and M. G. Hipkins. Apr. 1953. 12p.

The suitability of various solders for making composite joints between stainless steel, aluminum, and brass has been investigated. Of the solders considered, it was found that a tin–zinc solder (nominal composition 80% Sn, 20% Zn) could be applied to any of the three materials, enabling a composite joint to be prepared. The methods adopted for forming a "tinned" layer are described. The shear strengths of lap joints, prepared from strips of the three materials, are quoted. (auth)

8955 SEP-16
Sylvania Electric Products Inc., Bayside, N. Y.
THE PRODUCTION OF URANIUM POWDER. Norman P. Pinto. May 26, 1949. Decl. Jan. 19, 1959. 20p. $3.30(ph), $2.40(mf) OTS.

A method of producing uranium powder from reguline uranium based on the synthesis of uranium hydride, UH_3, and its subsequent decomposition is described. The pilot plant method used in making powder for current investigations and method, equipment, and techniques are presented. It is shown that the cost of producing uranium powder is less than the cost of re-melting the scrap material from which the uranium is made. The characteristics of the powder, including purity, particle size, and size distribution, are given. Efforts have been concentrated in developing methods and techniques for producing uranium bars of high density and superior physical properties. The powder metallurgy techniques for producing such bars are outlined. (auth)

8956 TID-7560

Division of Nuclear Materials Management, AEC and Michigan State Univ., East Lansing. Coll. of Engineering.

PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 208p. $2.00(OTS).

A compilation of the papers presented at the Reactor Fuel Measurement Techniques Symposium is presented. Twenty-three papers were presented covering a variety of fuel measurement aspects, twenty of which are included in the compilation. Separate abstracts have been prepared for each paper. (J.R.D.)

8957 TID-7560(p.5-8)

Combustion Engineering, Inc. Nuclear Div., Windsor, Conn.

SAMPLING TO CONTROL FUEL ALLOY WITH REMARKS ON BLENDING TO IMPROVE QUALITY. K. W. Last and J. Skory. p.5-8 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 4p.

A method of sampling fuel alloys for core loadings where several filler configurations are made from fuel alloy having the same nominal concentration is considered. The requirements governing fuel alloy manufacture upon which the method depends are stated, and the sampling techniques as well as control of the melting process are described. By applying these techniques, the variances for uranium and poison of each type filler loading are obtained. Application of the test to subassemblies and clusters is shown. In addition, blending as a technique to reduce process variability is discussed. The blending technique is described, and the results of statistical analysis are tabulated. (J.R.D.)

8958 TID-7560(p.9-29)

Oak Ridge National Lab., Tenn.

SEGREGATION IN URANIUM–ALUMINUM ALLOYS AND ITS EFFECT ON THE FUEL LOADING OF ALUMINUM-BASE FUEL ELEMENTS. W. C. Thurber and R. J. Beaver. p.9-29 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 20p. (ORNL-2476).

Previously abstracted as ORNL-2476, NSA 12-15356.

8959 TID-7560(p.30-9)

Knolls Atomic Power Lab., Schenectady, N. Y.

STATISTICAL ASPECTS OF MELT SAMPLING. G. L. Burrows. p.30-9 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 10p.

A statistician looks at melt sampling and finds considerable opportunity for the application of statistical sampling and analytical techniques. On the other hand careless application of the techniques can and does lead to erroneous interpretation of sample measurements made to evaluate process capability, process control, acceptance or rejection and materials accountability. The critique is not of statistical methods but of application of the methods; it is intended to stimulate a greater but more discriminate use of statistical methods in melt sampling. (auth)

8960 TID-7560(p.40-55)

General Electric Co. Vallecitos Atomic Lab., Pleasanton, Calif.

THE DETERMINATION OF FUEL UNIFORMITY BY COUNTING. Lewi Tonks. p.40-55 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 16p.

To determine the uniformity of loading of fuel plates, many small areas of such plates were counted. Such counts contain background and have a statistical spread, as well as a spread due to nonuniformity of loading. The analysis here presented shows that this method only permits one to calculate the probability that the nonuniformity is less than any stated value. Although an exact determination of nonuniformity would be more desirable, the ability to fix a range within which the nonuniformity most probably lies is still very useful. This range can be narrowed by increasing the total time devoted to counting. (auth)

8961 TID-7560(p.56-72)

Knolls Atomic Power Lab., Schenectady, N. Y.

DETERMINATION OF U^{235} HOMOGENEITY AND LOADING USING SCINTILLATION SPECTROMETRY. W. C. Judd and M. B. Leboeuf. p.56-72 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 17p. (KAPL-1925).

Previously abstracted as KAPL-1925, NSA 12-13100.

8962 TID-7560(p.73-82)

General Electric Co. Vallecitos Atomic Lab., Pleasanton, Calif.

ISOTOPIC ANALYSIS OF URANIUM DIOXIDE PELLETS BY SCINTILLATION SPECTROMETRY. B. F. Rider. p.73-82 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 10p.

Gamma scintillation spectrometry offers a rapid method for nondestructive isotopic analysis for fuel enrichment. It has been found convenient to measure enrichment by comparison of the ratio of the height of the 184 kev U^{235} peak to the height of the 90 kev peak originating primarily from U^{238} daughters. The method applies only to cold, clean, uranium in equilibrium with its short-lived daughters. The accuracy of the method when reasonable counting statistics are collected is well within $\pm 0.05\%$ U^{235}. (auth)

8963 TID-7560(p.83-7)

Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.

AN IMPROVED METHOD OF MEASURING URANIUM CONCENTRATION IN URANIUM–ALUMINUM ALLOY BY GAMMA COUNTING. P. F. Haughton, C. R. Fultz, and L. E. Burkhart. p.83-7 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 5p. (Y-1176).

Previously abstracted as Y-1176, NSA 12-4139.

8964 TID-7560(p.88-104)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
X-RAY SPECTROGRAPHIC DETERMINATION OF URANIUM AND PLUTONIUM IN ALUMINUM ALLOYS AND OTHER REACTOR FUEL MATERIALS. M. C. Lambert. p.88-104 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 17p.

Principles of x-ray spectrography and techniques of sample preparation are briefly discussed. Methods are described for the determination of uranium or of plutonium in aluminum alloys and in cryolite, and for the determination of uranium in bismuth. Methods are also described for measuring the thickness of aluminum cladding over an aluminum–plutonium alloy fuel core by attenuation of the plutonium x-ray fluorescence, and for determining the core thickness by x-ray absorption. (auth)

8965 TID-7560(p.105-15)
Nuclear Metals, Inc., Cambridge, Mass.
QUANTITATIVE ANALYSIS FOR URANIUM IN URANIUM–ALUMINUM ALLOYS BY X-RAY FLUORESCENT SPECTROMETRY. F. A. Bauman, Jr., L. P. Zopatti, and E. B. Read. p.105-15 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 11p.

A rapid and accurate method of analysis for uranium content of aluminum base alloys is described. Solutions of the alloy in mixed fluoboric and nitric acids are analyzed for uranium content by an x-ray fluorescent procedure. By careful control of the amount of mixed acid present, precise analytical data are obtained without the use of an internal standard. The interference effect of common acids and the correction required for enriched uranium is discussed. To obtain optimum precision and accuracy, standard samples are run with each set of samples and a standard curve is prepared. The time required for analysis of 1 to 5 samples is competitive with that required by other methods of analysis. On a routine basis, 60 analyses per 8 hour day may be performed by x-ray fluorescent analysis with an accuracy of ±1%. (auth)

8966 TID-7560(p.116-22)
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE DETERMINATION OF URANIUM IN ZIRCONIUM BASE FUEL ALLOYS BY FLUORESCENT X-RAY ANALYSIS. Raymond Burton, Harold D. Cook, Ralph M. Jacobs, and Edward R. Valecko. p.116-22 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 7p. (WAPD-T-739).

The use of the x-ray analytical method for the rapid control analysis of uranium in zirconium base fuel alloy is discussed. The accuracy of the method, ±1% of the amount present, compares favorably with that obtained by routine wet chemical methods. The x-ray method is compared with the chemical procedure. The time expended to obtain a composite ingot analysis by chemical methods is 1.5 man hours with a minimum lead time of 1.5 days required. Ingot analysis by x-ray fluorescence consumes approximately 0.5 man hours and requires a lead time of 0.75 days. Also additional information is obtained with the x-ray procedure since results from three positions in the ingot are available. Thus, better process control is achieved at less cost. (auth)

8967 TID-7560(p.123-6)
Combustion Engineering, Inc. Nuclear Div., Windsor, Conn.
EVALUATION OF THE X-RAY FLUORESCENT SPECTROMETRIC DETERMINATION OF URANIUM IN ZIRCALOY-2 FUEL ALLOY. Allen S. Powell and William C. Taylor, Jr. p.123-6 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 4p.

Uranium determination in Zircaloy-2 fuel alloy by x-ray fluorescent spectrometry was evaluated to find sources of error. At the 99-99 confidence level the method gives an error of about ±1% if instrumental and sample errors are controlled. Particular sources of variability due to instrumentation and sample preparation are pointed out. (auth)

8968 TID-7560(p.127-38)
Aerojet-General Nucleonics, San Ramon, Calif.
QUALITY CONTROL WITH A MASS PRODUCED REACTOR. M. B. Gustavson and J. C. Sherwin. p.127-38 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 12p.

A mass produced nuclear reactor was used to evaluate nondestructively some of the macroscopic properties of reactor fuels and moderators. Fuel studies included the evaluation of impurities in various samples of uranium oxide and determinations of the isotopic enrichment of metallic uranium samples. Moderator studies included the comparative evaluation of several grades of beryllium. Data are presented for the uranium and beryllium systems and evaluated in terms of quality control. (auth)

8969 TID-7560(p.139-52)
Phillips Petroleum Co. [Atomic Energy Div.], Idaho Falls, Idaho.
USE OF THE RMF FOR NONDESTRUCTIVE ASSAY OF FUEL-BEARING SAMPLES. E. Fast, D. W. Knight, R. G. Nisle, and D. A. Millsap. p.139-52 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 14p.

The Reactivity Measurement Facility (RMF), a critical assembly located in the Materials Testing Reactor (MTR) canal, was used in the non-destructive analysis of thorium slugs for U^{233} and of Engineering Test Reactor (ETR) fuel element core alloy for both U^{235} and boron. Normalization of reactivity measurements for the thorium slugs was accomplished by chemical-mass spectrographic analysis on two slugs. A procedure using delayed neutron production relative to that in a U^{235} slug is also shown to be feasible. Simultaneous determination of both U^{235} and boron in 1 to 2 gram core alloy samples is possible because of the marked difference in the relative response of the RMF to fuel and pure absorber for various points in its experimental

volume. A standard deviation of about 0.007 wt. % of boron and 0.20 wt. % of U^{235} was observed, which corresponded to 7.4 and 1.5%, respectively, of the content of the samples measured. (auth)

8970 TID-7560(p.153-6)
Oak Ridge National Lab., Tenn.
METHODS USED AT ORNL TO ASSAY URANIUM IN FUEL ELEMENTS AND HOMOGENEOUS REACTOR FUEL. P. F. Thomason, L. T. Corbin, and M. T. Kelley. p.153-6 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 4p.

Two chemical methods for the determination of uranium in alloys and Homogeneous Reactor fuel are discussed. Special apparatus for the automatic potentiometric titration of uranium is described. Statistical data for this titration, and for the controlled-potential coulometric titration of uranium in Homogeneous Reactor fuel are presented. The data show that both titrations can be performed by technicians with good precision and with a minimum of attention. (auth)

8971 TID-7560(p.157-63)
Argonne National Lab., Lemont, Ill.
THE QUANTITATIVE SPECTROGRAPHIC DETERMINATION OF ZIRCONIUM AND NIOBIUM IN URANIUM METAL. J. A. Goleb. p.157-63 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 7p.

A rapid method for the spectrographic analysis of alloys containing zirconium and niobium is presented. The method of sample preparation and sparking procedure is described, and the results are tabulated. The average deviation from the mean for ten consecutive determinations was ±2.89% for zirconium and ±2.16% for niobium. The average deviation of the spectrographic results from the mean chemical results is ±3.14% for zirconium and ±3.83% for niobium. (J.R.D.)

8972 TID-7560(p.164-71)
Argonne National Lab., Lemont, Ill.
A DIFFERENTIAL PRESSURE GAUGE TO DETERMINE THE DENSITIES OF UO_2–NaK SLURRIES. H. E. Flotow, B. M. Abraham, and R. D. Carlson. p.164-71 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 8p.

An instrument is described for measuring the pressure drops in a flowing stream of NaK or suspensions of UO_2 in NaK with sufficient precision and accuracy to determine the composition of the fluid. Mixtures of molten fluoride salts can be analyzed for uranium with an order of precision that compares favorably with that for other reactor fuels. Diagrams, photographs, and graphs are included. (J.R.D.)

8973 TID-7560(p.172-8)
Oak Ridge National Lab., Tenn.
THE SAMPLING OF MOLTEN FLUORIDE SALTS AND THEIR ANALYSIS FOR URANIUM. J. C. White. p.172-8 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 7p.

Two types of metallic samplers were developed which made possible the sampling of molten fluoride salt mixtures, such as NaF–KF–LiF–UF_4, NaF–ZrF_4–UF_4, and NaF–BeF_2–UF_4, at temperatures as high as 600°C. In one type, in which the sampler is an integral part of the system, the molten salt is passed through a micrometallic, nickel-frit filter into a chamber and out an overflow pipe. The chamber is then removed from the system and its contents analyzed. The second type of sampler is essentially a metallic filter stick through which the molten salt is drawn by vacuum through a metallic frit into a metal reservoir. Since high-melting deposits may remain in the sampler, the frozen salt is removed by knocking it loose from the container walls rather than by melting the contents. In either case, the entire contents of the samplers are ground to pass a 60-mesh sieve. Criteria considered in the selection of a suitable method for determining the uranium content of these salts included accuracy, reproducibility, and analysis time. In order to achieve a satisfactory degree of accuracy and reproducibility, the size of the sample was usually at least two, and often as much as ten grams. The salts are dissolved in a mixture of sulfuric, nitric, and boric acids. An aliquot of the resulting solution, which is essentially a solution of sulfate salts of approximately 0.5 M sulfuric acid, was analyzed for uranium by the Jones reductor–ceric sulfate method. The coefficient of variation of this method is 0.5%. Samples which were taken from the ARE during the process of bringing the reactor to criticality, were analyzed by fusing an intimate mixture of the fuel and boric acid with potassium pyrosulfate. (auth)

8974 TID-7560(p.179-88)
Argonne National Lab., Lemont, Ill.
THE ANALYTICAL APPLICATION OF THE NITRIC ACID ANION EXCHANGE SYSTEM TO PLUTONIUM-FISSIUM AND PLUTONIUM-BINARY ALLOYS USED IN METALLURGICAL STUDIES. R. F. Buchanan, J. P. Faris, K. A. Orlandini, and J. P. Hughes. p.179-88 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 10p.

The elution characteristics of Pu, Zr, Nb, Mo, Ru, Rh, Pd, Ce, U, Am, and Fe in nitric acid medium were found with Dowex-1 X10 anion exchange resin. The elution curves were obtained by using the appropriate radioactive tracer in all cases except rhodium and it was estimated spectrographically. The elution properties of over 60 elements in nitric acid media were studied, most of those not mentioned above were estimated spectrographically. A very limited amount of quantitative analytical data has been reported for the determination of U, Zr, Ce, and Mo when present as a binary alloy with plutonium and varying in percentage from about 40 to 75. It is assumed that since the method works in that range it would also be valid from 10 to 90% which is the range to be covered in the binary alloy studies. The separation of the elements which are readily eluted from plutonium on the anion column would be very useful for Pu-binary and Pu-fissium alloys, but Pu–U–Fs alloys would require further separation from uranium. (auth)

8975 TID-7560(p.189-96)
Argonne National Lab., Lemont, Ill.
THE SEPARATION AND DETERMINATION OF MICROGRAM AMOUNTS OF ZIRCONIUM AND RHODIUM IN FISSIUM ALLOYS. H. B. Evans and J. H. Patterson.

p.189-96 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 8p.

Microdetermination of zirconium and rhodium in fission alloys is described. The zirconium is precipitated with cupferron, washed and wet ashed with sulfuric–perchloric acid, precipitated with ammonium hydroxide, dissolved in hydrochloric acid, and estimated in an alizarin lake. The rhodium is separated chromatographically and estimated spectrophotometrically as the rhodium(III) chloro complex. (J.R.D.)

8976 TID-7560(p.197-208)
Argonne National Lab., Lemont, Ill.
GAMMA COUNTING FOR MEASURING URANIUM CONTENT OF REACTOR FUEL ELEMENTS. W. J. McGonnagle. p.197-208 [of] PAPERS PRESENTED AT THE REACTOR FUEL MEASUREMENT TECHNIQUES SYMPOSIUM, HELD AT KELLOGG CENTER, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN, JUNE 18-20, 1958. 12p. (ANL-FGF-122).

A nondestructive method for determining U^{235} in uranium fuel element cores and complete fuel elements is described. The technique is based on the 184-kev gamma radiation associated with the decay of U^{235}. Experimental procedures, and results are discussed, pointing out the various necessary corrections. Block diagrams and graphs are included. (J.R.D.)

8977 TID-7562
Division of Reactor Development, AEC.
MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 257p. $2.50(OTS).

Twelve papers are presented on joining of stainless steel, Zircaloy, Inconel-X, U, and other reactor metals. Separate abstracts have been prepared for each paper. (T.R.H.)

8978 TID-7562(p.1-13)
International Nickel Co., Inc., [New York].
WELDING OF TYPE 347 STAINLESS STEEL. V. N. Krivobok. p.1-13 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 13p.

Data are given from high-temperature tensile tests, stress rupture tests, and hot ductility tests of all-weld-metal specimens of $^{19}/_{9}$ Cb, $^{19}/_{13}$ Cb, $^{19}/_{13}$ MnCb, and $^{19}/_{10}$ ElC. Tests of impact toughness of $^{19}/_{10}$ ElC after aging heat treatment at 800 and 900°F were run. A brief investigation of cracking tests of the 16-8-2 electrode is also reported. (T.R.H.)

8979 TID-7562(p.15-31)
Argonne National Lab., Lemont, Ill.
WELDING OF STAINLESS STEEL WHICH CONTAINS MORE THAN ONE PER CENT BORON. Nicholas Balai. p.15-31 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 17p.

The properties of high-boron stainless steels, cast and wrought, are summarized, and welding of these materials is discussed. The fabrication of experimental control rod sections, EBWR control rods, EBWR pressure vessel thermal shield, and fuel storage rack from this material is described. Corrosion and irradiation test data are given. (T.R.H.)

8980 TID-7562(p.32-56)
Knolls Atomic Power Lab., Schenectady, N. Y.
JOINING OF ZIRCALOY TO AUSTENITIC STAINLESS STEEL. Kenneth H. Koopman. p.32-56 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 25p.

In order to best utilize the advantages offered by Zircaloy-2 as a structural material in pressurized-water reactors, the development of a technique for producing a strong, ductile joint between Zircaloy and stainless steel was required. Welding, brazing, cladding, and diffusion-bonding procedures investigated in an attempt to solve this problem are described. Many of the brazing, arc-welding, and resistance-welding processes were tried along with newer processes such as ultrasonic welding and special processes such as diffusion bonding in a vacuum furnace or brazing under high-purity inert-gas atmospheres. This investigation showed that diffusion bonding in a vacuum furnace at 1000 to 1020°C gave good quality joints between Zircaloy-2 and 304 austenitic stainless steel which might be usable for joining some pressurized-water-reactor components. Joints brazed with pure silver also had a moderately good tensile strength of about 35,000 to 40,000 psi but would not be usable for joints exposed to pressurized hot water corrosion. However, the joints brazed with pure silver might find application for some reactor components not exposed to hot water. (auth)

8981 TID-7562(p.57-76)
Argonne National Lab., Lemont, Ill.
WELDING OF URANIUM. Robert A. Noland and C. C. Stone. p.57-76 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 20p.

The chemical, physical, and mechanical properties of U as they affect its welding techniques are discussed. The preparation of metal and the procedures for welding U and the safety precautions to be observed because of its toxicity are described. The fluidity of molten U makes some support necessary. (T.R.H.)

8982 TID-7562(p.78-135)
Nuclear Products-Erco Div., Acf Industries, Inc., Washington, D. C.; Argonne National Lab., Lemont, Ill.; Battelle Memorial Inst., Columbus, Ohio; General Electric Co. Hanford Atomic Products Operation, Richland Wash.; Oak Ridge National Lab., Tenn.; and Sandia Corp., Albuquerque, N. Mex.
WELDING PROBLEMS AND DEVELOPMENT PROGRAMS. Willis Groth, Cecil Stone, David C. Martin, E. B. Lavelle, P. Patriarca, W. J. Leonard, and C. F. Bild. p.78-135 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 57p.

Brief reports are given of current welding techniques at various sites: ACF Industries. Information is given on welding Be–Cu, ultra-high strength steels, and 7075 Al. ANL. Welding problems in reactor structures are discussed. The motor arc process for 0.020-in. thick Al cans, the automatic arc spot welding gun for EBWR fuel assemblies, and the techniques used for the EBR-1, Mk III core are described. BMI. Experience in welding end caps on various fuel elements, welding Ta, and ultrasonic welding of Nb and Mo to themselves and to each other is given. A program for devising a large specimen for evaluating various types of stress relieving is dis-

cussed. Hanford Works (General Electric). Objectives of welding programs in the various departments at Hanford are outlined. Current research in inert-gas-shielded tungsten arc welding of carbon steel pipe and aluminum pipe is briefly reported. Other welding projects in progress are: substitution of N_2 for Ar purge gas in welding stainless steels; welding in high vacuum; and electron beam welding. ORNL. Results of studies of oxidation resistance of high-temperature brazing alloys are given. Thermal expansion data for several brazing alloys and structural alloys are also given. Work on joining TiC and WC to metals is summarized. The brazing characteristics of several types of experimental Ni–Mo alloys for high-temperature service are given. Data are presented in comparison of the tensile properties of Inconel, Hastelloy, and INOR-8 weldments. Welding of type 347 stainless steel, Ti, Zircaloy-2, and Ti 110AT, in connection with the homogeneous reactor project is discussed. Sandia Corporation. The welding equipment and welding standards and qualifications at Sandia are described. Information is given on welding of Boral sheet, and on joining stainless steel wire to U. (T.R.H.)

8983 TID-7562(p.135-45)
WELDING OF INCONEL X. K. M. Spicer and G. R. Pease. p.135-45 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 11p.

This paper has been published as an Industrial Atom Monograph, TID-8015, March 1958, and was previously abstracted as NSA, Vol. 12, abstract No. 7261.

8984 TID-7562(p.145-55)
ZIRCONIUM WELDING. E. F. Cook. p.145-55 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 11p.

The welding of 0.035-in. thick by 6-in. wide Zr strip is described. The inert-gas tungsten arc process was used to fusion butt weld reactor grade Zr sheet into a continuous strip 1,000 ft long for foil fabrication. The procedure for welding and the mechanical properties of the welded joints and the rolling of the foil are described. (T.R.H.)

8985 TID-7562(p.155-73)
FABRICATION OF THIN WALL MOLYBDENUM SHAPES BY WELDING. W. F. Brown and Myron A. Pugaz. p.155-73 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 19p.

A welding fabrication procedure is described which is suitable for the production of thin walled molybdenum components such as tubes, crucibles, furnace liners, high frequency furnace susceptors, and heat exchangers. A detailed procedure for the fabrication of a thin walled tube is given. Sheet material 0.015 inches thick was used, and welding was done in air using the automatic inert-gas tungsten metal-arc process. The results indicate that thin molybdenum sheet material can be welded in air with the resulting joints exhibiting sufficient ductility to permit fabrication and use when precautions are exercised in all phases of fabrication and assembly. (auth)

8986 TID-7562(p.173-80)
PRACTICAL CONSIDERATIONS IN THE WELDING OF HEAVY ALUMINUM PLATE. Willis Groth. p.173-80 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 8p.

The welding of heavy plate of 6061 Al alloy is discussed in detail. Selection of filler metal, groove designs, wire size, amperage, shielding gas, and equipment are treated. (T.R.H.)

8987 TID-7562(p.181-91)
WELDING THIN-WALLED URANIUM CYLINDERS. E. L. Brundige, G. S. Hanks, and D. T. Doll. p.181-91 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 11p.

This paper has been published as an Industrial Atom Monograph, TID-8019, June 1958, and was previously abstracted in NSA Vol. 12, abstract No. 10625.

8988 TID-7562(p.191-208)
Los Alamos Scientific Lab., N. Mex.
SOLDERING OF URANIUM. G. S. Hanks, D. T. Doll, J. M. Taub, and E. L. Brundige. p.191-208 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 18p.

This paper has been published as an Industrial Atom Monograph, TID-8018, June 1958, and was previously abstracted as NSA Vol. 12, abstract No. 10624.

8989 TID-7562(p.209-25)
Sandia Corp., Albuquerque, N. Mex.
DYNAMIC PROPERTIES OF 6061-T6 ALUMINUM WELDMENTS. D. W. Grobecker. p.209-25 [of] MINUTES OF THE SEVENTH ANNUAL ATOMIC ENERGY COMMISSION WELDING CONFERENCE, HELD IN CHICAGO, ILLINOIS, NOVEMBER 6-8, 1957. 17p.

Typical mechanical properties of 6061-T6 base metal and 6061-T6 welded with 4043 filler are given. These values are not reliably obtained in production, and a program to establish values for setting up such weldment design objectives is described. The results of testing efforts in the program are reported, analyzed, and discussed. (T.R.H.)

8990 WADC-TR-52-251(Pt. VI)
Battelle Memorial Inst., Columbus, Ohio.
THE COMPRESSIVE CREEP BUCKLING OF METAL COLUMNS. PART VI. EFFECT OF INITIAL IMPERFECTION. [Period covered] April 1, 1957 to March 1, 1958. Alfred Rudnick, Robert L. Carlson, and George K. Manning. Apr. 30, 1958. 57p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: DESIGN DATA FOR METALS. Contract AF33(616)-3317. (AD-202491).

Tests were conducted to determine the effect of the initial imperfection of a column on its creep-buckling characteristics. The material used was 6Al-4V titanium alloy. Columns with initial imperfections ranging from L/1000 to L/70 (where L is the column length) were tested at temperatures of 750, 850, and 900°F. Initial imperfection was found to influence very strongly the creep–buckling behavior of a column. In general, a significant interrelationship was found to exist between column load, lifetime, temperature, and imperfection, i.e., the effects of any one factor are dependent upon the magnitudes of the other factors. The time-dependent secant- and tangent-modulus methods for estimating column capacity were investigated. It is shown that both estimates can be either conservative or nonconservative, depending upon the temperature and initial imperfection of the column. The Larson-Miller time-temperature parameter technique was applied to the data. The use-

fulness of this and similar parameters for correlating column-creep data is discussed. (auth)

8991 WADC-TR-54-270(Pt. V)
Cornell Aeronautical Lab., Inc., Buffalo.
INVESTIGATION OF THE COMPRESSIVE, BEARING, AND SHEAR CREEP-RUPTURE PROPERTIES OF AIRCRAFT STRUCTURAL METALS AND JOINTS AT ELEVATED TEMPERATURES. [Period covered]: May 1, 1957 through April 30, 1958. Luke A. Yerkovich. July 15, 1958. 96p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: DESIGN DATA FOR METALS. Contract AF33(616)-3456. (AD-206661).

A program was conducted to examine the high temperature strength and deformation characteristics of two high-strength airframe alloys when subjected to a variety of stresses under both short and long time loading. Specifically the object of the program was to determine the high-temperature tension, compression, bearing, and shear properties of selected airframe alloys with the ultimate purpose of correlating tension behavior with behavior under the various other types of loads and applying these basic data to predict the behavior of riveted joints undergoing creep deformation in tension, bearing, and shear. Data summarized in tabular and chart form of the high temperature properties of PH15-7 Mo stainless steel and 6Al-4V titanium alloy in tension, compression, bearing, and shear are given. In addition, correlations of the tensile creep-rupture properties with corresponding compression, bearing, and shear creep-rupture properties are presented. The creep-rupture characteristics of doubler-type riveted joints, which represent single units of a multiple riveted assembly, prepared from the test alloys are presented. Correlations between measured joint creep-rupture and predicted joint creep-rupture are also included. (auth)

8992 WADC-TR-57-298(Pt. 11)
Ford Motor Co., Dearborn, Mich.
IRON–ALUMINUM ALLOY SYSTEMS. PART 11. COMPARATIVE STUDY OF OXIDATION RESISTANCE IN THE Fe–Al SYSTEM. [Period covered] April through September 1958. Richard E. Heimerdinger. Oct. 1958. 23p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(600)-32448. (AD-207907).

A study of the oxidation resistance of Fe–Al alloys with varying aluminum content was made. Visual observations confirm the effect of aluminum (0 to 16%) on the oxidation resistance of Fe–Al alloys at temperatures to 2200°F and for periods of up to 500 hours. Attempts to quantitatively determine weight gain of Fe–Al alloys were not successful. The lack of reproducible weight gain data is suggested to be a result of oxide seams and inclusions. The addition of chromium was found to be beneficial only at the 7.50% chromium level. The apparent deleterious effects of chromium at levels both higher and lower than 7.50% is to be further investigated. An alloy containing 7.50% aluminum and 7.50% chromium is recommended for further study in view of its good oxidation resistance, corrosion resistance, and ductility. (auth)

8993 WADC-TR-57-298(Pt. 12)
Ford Motor Co., Dearborn, Mich.
IRON–ALUMINUM ALLOY SYSTEMS. PART 12. WELDING OF IRON–ALUMINUM ALLOYS. Progress Report [for] April 1, 1958 to September 30, 1958. R. Brooks and A. Volio. Nov. 1958. 39p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(600)-32448. (AD-207908).

Investigations were conducted for both fusion welding and resistance welding procedures for iron–aluminum alloys. Additional resistance spot and stitch welds were developed for heats E-1005 and E-1006. Fabrication of a J-57 Turbine Exhaust Cone made from iron–aluminum alloys was completed and submitted for testing. Information on the resistance welding of the stiffener and flange to the cone body is presented. Investigations were continued toward the development of coated iron–aluminum electrodes for manual arc welding to provide a weld metal deposit containing 7 to 9% aluminum content. A program for investigating high temperature brazing was initiated for two reasons, to develop a high strength brazing joint in iron–aluminum alloys suitable for use at elevated temperatures and to investigate brazing problems which would be likely in connection with aircraft fabrications. (auth)

8994 WADC-TR-57-666(Pt. I)
Research Chemicals, Inc., Burbank, Calif.
SELECTION AND EVALUATION OF RARE OR UNUSUAL METALS FOR APPLICATION TO ADVANCED WEAPONS SYSTEMS. PART I. A LITERATURE SURVEY. [Period covered] June 1957 to September 1957. Bernard Love. Apr. 25, 1958. 184p. Project title: METALLIC MATERIALS. Task title: UNIQUE METALLIC MATERIALS AND PROCESSES. Contract AF33(616)-5293. (AD-155685; PB-151311). $3.00(OTS).

A survey was made of the unclassified literature relating to the rare earth elements, hafnium, rhodium, and ruthenium. The best available data were compiled for the abundance and distribution of the elements, the methods of recovery from ores and purification, the reduction to metal, and the physical, chemical, and mechanical properties of the elements and their important compounds. (auth)

8995 WADC-TR-57-720(Pt. I)
Massachusetts Inst. of Tech., Cambridge.
THE EFFECT OF PRESTRAIN AND RETEMPERING ON ULTRA-HIGH STRENGTH STEEL. [Period covered] January 1, 1957 to January 1, 1958. Edwart T. Stephenson, Morris Cohen, and Benjamin L. Averbach. Jan. 31, 1958. 41p. Project title: METALLIC MATERIALS. Task title: LOW ALLOY AIRCRAFT STEELS. Contract AF33(616)-2012. (AD-206076).

The mechanical properties of pretempered, prestrained, and retempered ultra-high strength steel are reported. Pretempering temperatures were varied from 400 to 1200°F, prestrains from 0 to 7% elongation, and retempering temperatures from 70 to 1200°F. It is found that prestrain and retempering may cause a significant increase in the yield stress and tensile strength, but with an accompanying loss of ductility and toughness. On increasing the retempering temperature, a maximum occurs in the strength along with a minimum in the ductility and toughness. The temperature of the maximum shifts from 300 to 700°F with increasing pretempering temperature, and the minimum behaves similarly. Any tempering-prestrain combination which increases the strength appreciably also decreases the elongation-to-maximum-load to practically zero. This behavior severely limits the possible application of prestrained ultra-high strength steel. Prestrain and retempering (below the pretempering temperature) have

no observable effect on the fracture stress, the hardness, or the electron microstructure. Several phenomena are considered in an attempt to account for the results of this investigation. Substructure seemed to be the most promising model for explaining the observed behavior. The evidence is inconclusive. (auth)

8996 WADC-TR-57-754(Pt. I)
Massachusetts Inst. of Tech., Cambridge. Aero-Elastic and Structures Research Lab.
PROCEDURES FOR INCLUDING TEMPERATURE EFFECTS IN STRUCTURAL ANALYSES OF ELASTIC WINGS. PART I. AN EQUIVALENT PLATE METHOD OF STRUCTURAL ANALYSIS FOR ELEVATED TEMPERATURE STRUCTURES. William R. Mills. Nov. 22, 1957. 92p. Project No. 6-(8-1367). Contract AF33 (616)-3517. (AD-142234).

Some of the structural problems of a heated wing are discussed with specific emphasis on the necessary additions or changes needed in the standard non-thermal methods of analysis to include non-uniform temperature distribution in the structure. With the plate-like hypothesis as a starting point the differential equations of static deflection, including finite deflection terms, have been derived. This development yields two coupled non-linear partial differential equations in which the vertical deflection and the neutral surface stress function are the dependent variables. The development allows, the load distribution to be stated either explicitly or in terms of the deformed shape, the Young's modulus and the coefficient of thermal expansion to be functions of the local temperature, and the temperature distribution to be an arbitrary function of the space variables. The specific structural problems which can be derived as specializations of the general deflection equations are stress analysis, deflection analysis, wing divergence and aileron effectiveness. A proposed solution by the assumed mode method is outlined. The equations governing the dynamic properties of the wing are derived by including the inertial force in the pressure term of the vertical equilibrium equation. These equations are further simplified by assuming small vibrations about a static deformed shape. This reduces the type and the number of the differential equations to one linear equation which has the vibratory deflection as the dependent variable. A procedure for solving for the natural vibratory mode shapes and frequencies by the assumed mode method is considered. The aerodynamic loads are described using piston theory aerodynamics. This two-dimensional aerodynamic theory allows the pressure at any point on the wing to be described in terms of the angle of attack, thickness, and motion at that point. (auth)

8997 WADC-TR-58-214
Minnesota. Univ., Minneapolis.
EFFECT OF STATIC PRESTRAIN ON THE PROT-FATIGUE PROPERTIES OF UNNOTCHED AND NOTCHED MATERIALS AT ROOM AND ELEVATED TEMPERATURE. Period covered: January 1956 to December 1957. F. H. Vitovec. Apr. 15, 1958. 67p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: FATIGUE PROPERTIES OF STRUCTURAL MATERIALS. Contract AF33 (616)-2803. (AD-155738; PB-151280). $1.75(OTS).

A study was conducted on the effect of short time and creep prestrain on the fatigue properties of unnotched and notched specimens of the alloys 7075-T6 extruded, 2024-T4 extruded, 16-25-6 hot-cold-worked, and S-816 solution treated and aged. Fatigue properties were determined using a Prot-type test with a single loading rate of 0.01 psi per cycle. The unnotched and notched specimens were prestrained at test temperature and then immediately subjected to a Prot-type fatigue test at the same temperature and in the same testing machine. The test temperature for the short time prestrain and creep prestrain, respectively, were 75 and 300°F for 7075-T6, 300 and 500°F for 2024-T4, 1200°F for 16-25-6, and 1500°F for S-816. Short-time prestrains up to 10% were applied. Stresses used for the creep prestrains corresponded to those which produced rupture in 100 to 200 hours at test temperature. The main factors influencing the Prot-failure stress were residual stresses, metallurgical reactions, and cracks produced by prestraining. Strain hardening and relaxation of residual stress appeared to be of secondary importance for the materials and range of testing variables investigated. (auth)

8998 WADC-TR-58-274
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
MEASUREMENTS OF THERMAL PROPERTIES. [Period covered] July 1, 1957 to March 31, 1958. I. B. Fieldhouse, J. C. Hedge, and J. I. Lang. May 1, 1958. 87p. Project title: G. E. ANP MATERIALS. Task title: MATERIALS FOR G. E. SUBSYSTEMS. Contract AF33(616)-3701. (AD-206892).

The materials investigated were stainless steel type 316, stainless steel type 347, Hastelloy R-235, aluminum oxide, niobium, lithium hydride and synthetic sapphire. The thermal conductivity, specific heat, and linear thermal expansion were measured from 100 to 3000°F, or to the melting point of the material, whichever was lower. Both the experimental measurements and the results of the conversion of these measurements to the desired physical properties are given. (auth)

8999 WADC-TR-58-406
Michigan. Univ., Ann Arbor. Research Inst.
ELECTRON METALLOGRAPHIC STUDIES OF NICKEL-BASE HEAT-RESISTANT ALLOYS. W. C. Bigelow and J. A. Amy. Aug. 1958. 56p. Project No. 7021. Contract AF33(616)-3250. (AD-155767).

Methods are described which have proven satisfactory for polishing and etching nickel-base alloys for electron metallographic examinations. Extraction replica techniques for isolating γ' and carbide particles from the alloys for study by selected-area electron diffraction are also given. Electron microscopic studies were made of the changes in microstructures of the commercial alloys, Inconel-X, Waspaloy, M-252, and Udimet-500, during aging at 1400 and 1600°F. Hardness variations are correlated with the precipitation of the γ' phase, and the possible mechanisms contributing to the observed variations are discussed. Electron diffraction studies showed that the γ' phase has an ordered structure, and precipitates with a preferred orientation in the matrix. Lineal and spectrographic analyses indicate that the composition of the phase is more complex than is indicated by the usual formulas of Ni_3Al and $Ni_3(Al,Ti)$. Microstructural studies were made of an experimental alloy of high Ti and Al content, and of a cast nickel-base alloy. Investigations were made to determine the nature of a banded structure which is associated with low rupture strength, and to study the influence of small additions of boron and zirconium on the precipitation of the γ' phase. (auth)

9000 WADC-TR-58-525
Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF THE PROPERTIES OF TANTALUM AND ITS ALLOYS. [Period covered] May 1, 1958 through July 31, 1958. William D. Klopp, Fred R. Schwartzberg, Frank C. Holden, Chester T. Sims, H. Russell Ogden, and Robert I. Jaffee. Sept. 5, 1958. 84p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(616)-5668. (AD-206073).

A survey of literature pertaining to tantalum and tantalum alloys was carried out as part of the study of the properties of tantalum and its alloys. The results of that survey are reported in narrative style with references to published data. A bibliography of available publications is included. Emphasis was placed on subjects pertinent to the research being conducted on this project with a more general coverage of other subjects. 205 references. (auth)

9001 WAL-TR-371/49
Watertown Arsenal Lab., Mass.
EFFECTS OF SEVERAL IMPREGNANTS OF THE OXIDATION RESISTANCE OF GRAPHITE. P. T. Whelan. Nov. 1957. 25p. DA Project 5U17-01-002. (AD-149513).

The effects of impregnating graphite with the oxides and carbides of silicon, zirconium, boron, and chromium on its high-temperature oxidation characteristics were investigated. All of these impregnants reduced the oxidation rate except the carbide and oxide of chromium, which increased it. The impregnation was accomplished by quenching the heated graphite into a prepared solution. The data show that impregnation of graphite with the following materials is effective in promoting oxidation resistance in a decreasing order: (1) silicon carbide, (2) zirconium carbide, (3) boron oxide, (4) silicon dioxide, (5) zirconium dioxide, (6) boron carbide. With silicon carbide it was found that multiple quenching, up to three, improves oxidation resistance. (auth)

9002 WAPD-TD-51
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PREPARATION OF CHEAP ALTERNATE FEED MATERIAL FOR THE MANUFACTURE OF ZIRCONIUM CRYSTAL BAR. H. R. Hoge and Z. M. Shapiro. Mar. 20, 1952. Decl. July 11, 1957. 20p. $3.30(ph), $2.40(mf) OTS.

The preparation, directly from zirconium oxide and zirconium carbide, of materials which are suitable for replacing zirconium sponge in the manufacture of zirconium crystal bar is discussed. The reactivity of these materials with iodine is compared with that of zirconium sponge, Bureau of Mines zirconium carbide, and T.A.M. zirconium carbonitride. Two of the materials prepared were applied successfully to the preparation of crystal bar in a small deposition unit. (auth)

9003 WAPD-ZH-13
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ZIRCONIUM HIGHLIGHTS. Dec. 1958. 29p. Contract AT-11-1-GEN-14. $4.80(ph), $2.70(mf) OTS.

An investigation was conducted to determine the extent and the subsequent effect of Zircaloy-2 surface contamination when the Zircaloy is rolled in contact with low carbon steel. Zircaloy-3 powder was prepared by attritioning in a helium atmosphere. Preliminary investigation showed good corrosion resistance and reasonably good mechanical properties. The explosion of zirconium powder compacts is discussed. The effect of heat treating temperature on the corrosion resistance of furnace-cooled Zircaloy-2 is discussed. Mechanical tests of Zircaloy-2 after autoclave tests and diffusion annealing are presented. (For preceding period see WAPD-ZH-12.) (W.L.H.)

9004 WCLT-TM-58-125
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
SUMMARY OF THIRD HEF COMBUSTION PRODUCT CORROSION WORKING GROUP MEETING. James R. Myers. Dec. 29, 1958. 70p. Project No. 3048.

Static and dynamic test programs for the evaluation of selected high-temperature alloys, cermets, and ceramics with respect to their corrosion resistance to simulated boron fuel combustion products are presented. (W.L.H.)

9005 AEC-tr-3100(Pts. I and II)
USES OF RADIOACTIVE ISOTOPES IN METALLURGY, SYMPOSIUM XXXIV. PARTS I AND II. (Primenie Radioaktivnykh Izotopov v Metallurgi, Sbornik XXXIV.) Translated from a publication of the State Scientific-Technical Publishers of Literature on Non-Ferrous and Ferrous Metallurgy, Moscow, 1955. (Pt. I, 280p. and Pt. II, 58p.). (Pt. I, $4.00(OTS) and Pt. II, $1.75(OTS).

These two parts were issued separately, but are cataloged as a unit.

Some of the theoretical works are concerned with investigations of diffusion and self-diffusion processes in alloys, oxidation mechanisms, kinetics, equilibrium distributions of various elements between phases, and thermodynamic characteristics of components in liquid and solid solutions. Research work on a method for determining the variations in diffusion and thermodynamic characteristics and for determining the elasticity of steam, as well as some work on the application of labeled atoms in the analysis of alloys, is presented. Research data are presented on the performance of metallurgical aggregates in blast, open hearth, and electric furnaces investigated with labeled atoms. The diffusion of Ti into graphite, distribution of carbon in steel after high-frequency annealing, and the distribution of other metals in steel are reported. (W.L.H.)

9006 AEC-tr-3436
LITHIUM AND ITS ALLOYS. (Litii i Ego Splavy). F. I. Shamrai. Translated from a publication of the Academy of Sciences, U.S.S.R., Moscow, 1952. 232p. $3.00(OTS).

The introduction and the first five chapters of this volume discuss the characteristics of the metal, the methods of its recovery from raw materials, and methods of chemical analysis used. Chapter six presents the physical properties and constitution diagrams for a large number of binary lithium alloys. Chapter seven does the same for ternary alloys of lithium. (W.L.H.)

9007 AEC-tr-3439
PHYSICAL CHEMISTRY OF PYROMETALLURGICAL PROCESSES. PART II. THE INTERACTION OF LIQUIDS WITH GASES AND SOLID PHASES. (Fizicheskaya Khimiya Pirometallurgicheskikh Proteessov. Chast Vtoraya. Vzaimodeistvie Zhudkostei s Gazami.) O. A. Esin and P. V. Gel'd. Translated from a publication of the State Scientific-Technical Publishers of Literature on Ferrous and Non-Ferrous Metallurgy, Sverdlovsk-Moscow, 1954. (Issued in two books: Bk. 1, 369p. and Bk. 2, 307p.). $6.75(OTS).

Investigations are presented of the structure and interaction (equilibrium and kinetics) of liquid phases in ferrous metallurgy. Only the most important of the indicated problems are examined: crystallization and fusion, structure of molten metals and slags, structure of glasses as supercooled liquids, forms of existence of metalloids dissolved in metals, interaction of gases with the metal and slag, and reactions of desulfurization, dephosphorization, and decarburization. (W.L.H.)

9008 AEC-tr-3564

ON THE GRAIN REFINING OF URANIUM. (Sur l'Affinage du Grain de l'Uranium.) J. Beroujon, M. Englander, J. A. Stohr, and A. Winogradsky. Translated by Liz Appleby (Hanford Atomic Products Operation) from report CEA-694, 1957. 22p. $3.30 (ph), $2.40(mf) JCL or LC.

The technical conditions were determined for treatment of uranium, extruded in the gamma phase, in order to obtain fine and equiaxial grains. (auth)

9009 CEA-tr-A-494

DÉCARBURATION DE QUELQUES ACIERS ALLIÉS PAR L'HYDROGÈNE. (Decarbonization of Some Alloyed Steels with Hydrogen.) W. Baukloh and H. Guthmann. Translated into French by R. Carbonnier from Arch. Eisenhüttenw. 9, 201-2(1935). 10p.

Some preliminary tests were made on decarbonization between 700 and 1000°C in a hydrogen current of some nonalloyed steels and steels with nickel, chromium, manganese, silicon, tungsten, molybdenum, vanadium, tin, and copper. For the nonalloyed steels, there is produced below 700°, with an increase in the carbon content, an increase of the velocity of decarbonization, whereas this velocity decreases with the increase in carbon content above 700°C. No correlation was found between the phase diagram of the alloys used and their decarbonization. There appears to be a relationship between the carbon content and the "most favorable" content of alloying elements. These are the steels with up 0.9% chromium which are the most resistant to the action of hydrogen. (tr-auth)

9010 CEA-tr-A-496

REPARTITION DE LA TEMPERATURE ET DE LA TENSION DANS UN ELEMENT DE COMBUSTIBLE CYLINDRIQUE NON GAINE ET SUFFISAMMENT LONG. (Distribution of the Temperature and Pressure in a Long Unclad Cylindrical Fuel Element.) W. Hage. Translated into French from Atomkernergie 3, 49-53 (1958). 16p.

By beginning with an average distribution of heat sources, one can calculate with sufficient precision the temperature and the radial and tangential pressures in a cylindrical fuel element for the values KR < 1. For values of KR > 1 there are errors always > 4%. With this simplification the error is always on the safe side. For values of KR > 3, the values obtained are from 20 to 40% higher than the true values with the result that in this case it is necessary to consider the distribution of the heat sources by taking into account the thermal neutron flux. (tr-auth)

9011 CEA-tr-A-508

LA SOUDURE À L'ARC ET LE DÉCOUPAGE DE L'ALUMINIUM SOUS ATMOSPHÈRE INERTE. (Arc Welding and Cutting of Aluminum under an Inert Atmosphere.) W. Mantel and L. Wolff. Translated into French from Aluminium 34, 36-40(1958). 19p.

A survey is presented of the techniques and problems connected with the arc welding and cutting of aluminum in an inert atmosphere. The principal problem is the porosity, however there are several techniques for handling it. Arc cutting of aluminum was achieved by the use of a mixture of argon and hydrogen. (J.S.R.)

9012 CEA-tr-R-510

APPLICATION DE LA MESURE DE LA MICRODURETE A L'ETUDE DES DIAGRAMMES D'ÉQUILIBRE BINAIRES ET TERNAIRES DES SYSTEMES METALLIQUES. (Application of the Microhardness Measurement to the Study of the Diagrams of Binary and Ternary Equilibria of Metallic Systems.) V. M. Glasov, V. N. Vigdorovich (Vigdorovitch), and G. A. Korolkov. Translated into French from Zhur. Fiz. Khim. 31, 1891-7(1957). 13p.

By a study of the microhardness of crystals of a solid solution as a function of the composition of binary and ternary alloys, a physico-chemical justification was given to the possibility of using the method of microhardness to determine the phase limits for a structural disequilibrium of the phase studied. This disequilibrium is shown by the presence of particles of the second phase in the first phase. The actual "composition-microhardness" diagrams were proposed and verified experimentally for different cases of interaction of the components. (tr-auth)

9013 CEA-tr-R-579

DETERMINATION DE LA VITESSE DE DIFFUSION DE L'HYDROGENE DANS LES METAUX. (Determination of the Diffusion Velocity of Hydrogen in Metals.) R. A. Ryabov (Riabov) and P. V. Gueld. Translated into French by B. de Trezvinsky from Zavodakaya Lab. 24, 306-8(1958). 11p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 781.

9014 CEA-tr-R-588

METHODE MICROELÉCTROCHIMIQUE D'ÉTUDE DE LA CORROSION SOUS TENSION DES MÉTAUX. (Microelectrochemical Method for the Study of the Corrosion under Stress of Metals.) A. V. Ryabtchenkov (Riabtchenkov), V. M. Nikiforova, and V. F. Abramova. Translated into French from Zavodskaya Lab. 24, 167-78(1958). 16p.

A description is given of an installation designed for the electrochemical study of localized regions of a metal subjected simultaneously to a corrosive medium and a tensile stress. The stress corrosion of cast iron and several steels was investigated in 0.01 N HCl solutions with 0.09% H_2O_2, and the electrode potential was measured. The results show that static stresses displace the electrode potential of steel to more negative values. It was established that the potential of the grain boundary is more negative than the potential of the grain body. (J.S.R.)

9015 CEA-tr-X-114

LES MÉTAUX PURS. (Pure Metals.) Jose Terraza Martorell and Jacobo Diaz Diaz. Translated into French from Energia nuclear (Madrid) 1, No. 4, 27-38 (1957). 38p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 2208.

9016

STRUCTURE AND GROWTH OF BERYLLIUM OXIDE ON SINGLE CRYSTALS OF BERYLLIUM. V. D. Scott (Imperial Coll. of Science and Tech., London). Acta Cryst. 12, 136-42(1959) Feb.

The nature of the structure and growth of BeO films formed by heating single crystals of beryllium in air over a wide range of temperatures was studied in detail using electron diffraction, and electron microscopy. The epitaxial nature of the oxide formed in the temperature range 300°C to 400°C on a Be (001) cleavage face was established. In the case of electropolished (001) surfaces of beryllium, it was found that the epitaxial BeO overgrowth was less well-defined. It was suggested that this disorientation was due to the formation, during the electropolishing procedure, of surface elements other than (001) upon which the oxide could grow. One-degree (103)-oriented BeO was observed on (100) and (110) faces of Be. The oxidation rate increased with increase in temperature, resulting in a corresponding increase in the proportion of randomly-oriented BeO until, above 600°C, only random growth was observed in the upper regions of the layer. At about 800°C, a pronounced (001) habit of the randomly-oriented BeO crystals was developed. The diameter of the oxide crystals was estimated from the diffraction patterns to be some tens of Angströms below 300°C, and in the order of thousands of Angströms at about 800°C. The non-protective nature of the oxide layer formed at 600°C and above, is evident from the electron micrographs which showed the development of projecting needles of BeO up to 5μ in length and several hundred Angströms in thickness. The needles possessed a (110) axis, and possibly grew around screw dislocations. Thin BeO flakes up to several μ in diameter were also observed in this temperature range, the diffraction pattern indicating considerable distortion of the flake. (auth)

9017

THE SELF-DIFFUSION VELOCITY OF PURE CHROMIUM. Harold W. Paxton and Ewald G. Gondolf. Arch. Eisenhüttenw. 30, No. 1, 55-60(1959) Jan. (In German)

The velocity of self-diffusion in pure chromium was determined using Cr^{51}. The radioactive chromium was vapor deposited on cylindrical samples. The diffusion annealing was made between 950 and 1250°C with an annealing time from 5 to 30 days. It was measured by two methods: (1) measurement of the surface activity of the probe before and after the investigation and calculation of the self-diffusion coefficient from the difference and (2) taking thin layers from the sample and measurement of the activity found on the new surface. From the activity-distance graph the self-diffusion coefficient could be determined. The values found by both methods agreed within the measurement accuracy. The dependence of the self-diffusion coefficient of pure chromium on the temperature can be formulated in the form $D = 0.0001 \exp(-52700/RT)$. The results appear statistically accurate. Theoretical considerations and comparisons are given on the accuracy of the measured values. (tr-auth)

9018

HIGH-TEMPERATURE ALLOYS. Michel Urbain. Cobalt No. 1, 13-32(1958) Dec.

The applications of heat-resisting alloys to the construction of aircraft engines, rockets, airframes, missiles, and marine and land gas turbines are discussed. The composition of a number of Fe-base, Fe–Cr–Ni–Ce, Ni-base, and Co-base alloys is shown in tabular form, and discussions are included on the effects of composition and structure on high-temperature properties. Significant engineering properties of these alloys were compared. Data are included on the following: tensile tests at room and high temperatures; stresses necessary to cause rupture in 100 and 1,000 hours at various temperatures; high-temperature fatigue resistance; oxidation resistance; and thermal shock resistance. Considerations are given to hot forging and rolling, cold working of sheets, and the weldability of superalloys. (J.H.M.)

9019

ON THE EFFECTS OF SILVER AND ZINC ON THE ALUMINUM–COPPER ALLOY AGING PROCESSES. V. I. Arkarov and L. M. Magat (Inst. of Metal Physics, Urals Branch of Academy of Sciences, Sverdlovsk USSR). Fiz. Metal. i Metalloved. 6, 804-8(1958). (In Russian)

The slight slowing down effects of Ag (0.05 to 0.5%) and Zn (0.2%) on the disintegration of saturated solid solutions of Al and Co during initial aging processes at 245°C were observed by plotting the dependence of solid solution lattice parameter on aging duration. (R.V.J.)

9020

ON THE COMBINED EFFECTS OF SMALL ADMIXTURES OF CADMIUM AND SILVER OR ZINC ON THE Al–Cu ALLOY AGING. VI. V. I. Arkharov and L. M. Magar (Inst. of Metal Physics, Urals Branch of Academy of Sciences, Sverdlovsk USSR). Fiz. Metal. i Metalloved. 6, 809-11(1958). (In Russian)

The effects of Cd and Ag or Zn on Al–Cu alloy aging were investigated at the point when Cd accelerates and Ag or Zn slows down the disintegration of the saturated solid solution (245°C). In the event when the ratio of Ag admixture to Cd is 10.1 (wt. %), the Ag annuls the effects of Cd. (R.V.J.)

9021

EFFECTS OF THE GRAIN-SIZE ON CARBON DIFFUSION IN IRON. I. E. Kontorovich and Yu. M. Mermel'shtein (Moscow Metallurgical Inst. (Night School)). Fiz. Met. i Metalloved. 6, 812-18(1958). (In Russian)

The diffusion of carbon into iron increases with the enlargement of grain structure. The size of the grain can affect the diffusion depth 200 to 250%. Plastic deformation enhances the volume of carbon absorption and the diffusion depth. Recrystallization after plastic deformation reduces the depth of the diffusion. (R.V.J.)

9022

STUDIES OF 50% Fe–50% Ni ALLOY TEXTURE AT VARIOUS DEPTH. M. M. Borodkina and N. P. Gromov (Central Scientific Research Inst. of Ferrous Metals). Fiz. Metal. i Metalloved. 6, 819-24(1958). (In Russian)

Studies of permalloy deformation and recrystallization texture uncovered a weaker orientation (110) and (112), increased textural scattering, and disappearance of the cubic recrystallization texture in thicknesses reduced to 0.005 mm. Effects of deformation conditions on the texture and the texture of various layers of permalloy ribbon of 0.5 mm were investigated. (R.V.J.)

9023

X-RAY DIFFRACTION ANALYSIS OF Fe–Mo AND Fe–Mo–Co FERROMAGNETIC ALLOYS. B. Ya. Pines and I. N. Barutkin (Gor'kii Khar'kov State Univ.). Fiz. Metal. i Metalloved. 6, 832-7(1958). (In Russian)

A harmonic analysis of x-ray-diffraction curves was used for determining the microintensity and the dispersion of paramagnetic inclusions in Fe–Mo and Fe–Mo–Co alloys after various heat treatments. Structural characteristics and magnetic properties are correlated. (tr-auth)

9024

EFFECTS OF PLASTIC DEFORMATION ON STAINLESS STEEL PHASE CONSTITUTION. V. A. Tolomasov (Gor'kii Research Inst. of Physics and Tech.). Fiz. Metal. i Metalloved. 6, 838-42(1958). (In Russian)

Attempts were made to verify the character of plastic deformation effects on the phase constitution of stainless steel. (R.V.J.)

9025

DIAGRAM OF VOLUME CONSTITUTION PHASES IN STEEL. A. P. Gulyaev and B. M. Zel'bert (Moscow Machine Building Inst. Night School). Fiz. Metal. i Metalloved. 6, 843-8(1958). (In Russian)

Diagrams of austenite and martensite specific volume ratio at various temperatures and contents of carbon are plotted, and transitions from austenite to martensite are analyzed. (R.V.J.)

9026

THE CARBIDE-FORMATION IN CHROMIUM STEEL TEMPERING. B. A. Apaev (Gor'kii Inst. of Research in Physics and Tech.). Fiz. Metal. i Metalloved. 6, 858-65(1958). (In Russian)

The solubility of chromium in cementite and the formation of special carbide were studied. Data from magnetic analysis of various schemes of carbide formation during tempering of various chromium steels are presented. (R.V.J.)

9027

ON THE MICROHARDNESS OF SOME ZINC AND TIN BASE ALLOYS. A. A. Presnyakov and N. S. Sakharova (Inst. of Physics and Tech., Academy of Sciences, Kazakh SSR). Fiz. Metal. i Metalloved. 6, 886-92(1958). (In Russian)

The microhardness of Zn and Sn base alloys was studied in order to determine the plasticity and changes in plasticity during metastable state transition into equilibrium in Zn-Al, Zn-Cu, Sn-Sb, Sn-Pb, Sn-Zn, and Cu-Ni alloys. (R.V.J.)

9028

TEMPERATURE DEPENDENCE OF INTERNAL FRICTION IN PURE NICKEL. O. I. Datsko and V. A. Pavlov (Inst. of Metal Physics, Urals Branch of Academy of Sciences, USSR). Fiz. Metal. i Metalloved. 6, 900-4 (1958). (In Russian)

Data are presented on the temperature dependence of internal friction in recrystallized pure nickel. Two friction maxima were uncovered; the first depends on the viscous properties of the grain boundary, the second on the intensity relaxation at the block boundaries. (tr-auth)

9029

TEMPERATURE EFFECTS ON THE GRAIN SIZE ALTERATIONS AND SECONDARY DEFORMATION IN COLD ROLLED HEAT RESISTING STEELS. E. Yu. Chemadurova (All-Union Research Inst. of Pipe Mfg.). Fiz. Metal. i Metalloved. 6, 905-11(1958). (In Russian)

Temperature effects on the changes in fine structure of semiferrite and perlite steels were tested after deformation at 200 to 750°C, and on a ferrite-type steel at 100 to 750°C. (R.V.J.)

9030

EFFECT OF DEFORMATION ON THE CRYSTALLINE LATTICE PARAMETER OF X18H9T STEEL. A. P. Gulyaev and Ya. E. Sanchuk (Moscow Machine Building Inst.). Fiz. Metal. i Metalloved. 6, 947(1958). (In Russian)

The effects of plastic deformation on the solid solution crystalline lattice parameters of stainless steel X18H9T (0.09% C, 18.8% Cr, 9.7% Ni, 0.79% Ti, 0.63% Mn, and 0.46% Si) were studied in two states: heated to 1150°C and cooled in water and annealed to 1050°C and stabilized by tempering at 800°C for 12 hours. The plotted diagram shows that the tensile deformation reduces the parameter of the γ-phase crystalline lattice in annealed steel and transforms γ phase into α phase, while γ-phase crystalline lattice parameter of the stabilized steel remains unchanged. (R.V.J.)

9031

THE INVESTIGATION OF L_{III} ABSORPTION SPECTRA OF Ce IN CERIUM-ALUMINUM ALLOYS. S. A. Nemnonov and V. V. Klyushin (Inst. of Metal Physics, Urals Branch of the Academy of Sciences, USSR). Fiz. Metal. i Metalloved. 6, 951-2(1958). (In Russian)

The melting points of $CeAl_2$ and $CeAl_4$ intermetallics (1465 and 1250°C, respectively, and 830°C for Ce and 660°C for Al) indicate an increased strength in crystalline lattice intermolecular bonds. Investigations of Ce absorption L_{III} spectra show that the 6s and 5d states of the Ce atoms are the principle contributors to the interatomic bond formation in the $CeAl_2$ and $CeAl_4$ intermetallics. (R.V.J.)

9032

INTERNAL FRICTION MAXIMUM IN DEFORMED ALUMINUM. D. M. Ibragimova and A. I. Moiseeva (Inst. of Metal Physics, Academy of Sciences, USSR). Fiz. Metal. i Metalloved. 6, 952-4(1958). (In Russian)

The temperature dependence of Al (99.99% with 80% deformation) internal friction was studied at 600°C. The plotted diagram shows in addition to the standard 350°C maximum another maximum at 500°C. (R.V.J.)

9033

THERMOMAGNETIC TREATMENT AND ORDERING PROCESSES. III. EFFECTS OF THERMOMAGNETIC TREATMENT ON THE ELECTROCONDUCTIVITY OF ORDERED MAGNETIC ALLOYS. Ya. S. Shur and A. A. Glazer (Inst. of Metal Physics, Academy of Sciences, USSR). Fiz. Metal. i Metalloved. 6, 958-60(1958). (In Russian)

The electrical resistance of ordered soft magnetic alloys was measured in order to determine the effects of successive annealing, in magnetic fields at temperatures below the critical ordering temperature T_c, on the superstructure of ordered specimens. The effects of the magnetic field on ordering kinetics in annealing of disordered specimens at temperatures below T_c were also investigated. (R.V.J.)

9034

ALUMINUM NITRIDE, A REFRACTORY FOR ALUMINUM TO 2000°C. George Long and L. M. Foster (Aluminum Co. of America, New Kensington, Penna.) J. Am. Ceram. Soc. 42, 53-9(1959) Feb.

In commercial practice, where temperatures are low, a number of commercially available materials are satisfactory as a container for molten aluminum. None of these, however, resists attack by aluminum in the temperature range 1800 to 2000°C. An investigation was conducted to find a material completely inert to aluminum at these high temperatures. Aluminum nitride emerged as the material that was inert to aluminum and showed satisfactory properties as a ceramic material. A method of preparing high-purity AlN by striking a d-c arc between two high-purity aluminum electrodes in a nitrogen atmosphere is described. A refractory having excellent strength and low porosity was achieved

by hydrostatic pressing and firing at high temperatures. The mechanical, electrical, thermal, and chemical properties of the refractory are discussed. (auth)

9035

RECRYSTALLIZATION OF CERIUM OXIDE IN PORCELAIN ENAMELS. Elwin L. Johnson and A. L. Friedberg (Univ. of Illinois, Urbana). J. Am. Ceram. Soc. 42, 60-9(1959) Feb.

The effect of cerium oxide incorporated as the principal opacifying agent in the frit batch on the properties of white cover-coat porcelain enamels was studied. The effect of several variables on the opacity of the enamel was investigated as a function of firing temperature. Variables studied included (a) the amount of cerium oxide added, (b) the manner in which cerium oxide was incorporated into the enamel, i.e., mill addition, frit addition, or combination of both, (c) composition of the base glass, (d) weight of application, and (e) type of mill addition. Porcelain enamels were produced which had good acid resistance, high gloss, and a reflectance of 80% or more. Mill-added cerium oxide seemed to be less effective than that which was incorporated in the porcelain enamel as a component of the frit. The spectrophotometric analysis indicated good color stability of cerium oxide enamels. (auth)

9036

ZETA POTENTIALS IN RELATION TO RHEOLOGICAL PROPERTIES OF OXIDE SLIPS. P. J. Anderson and P. Murray (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Am. Ceram. Soc. 42, 70-4 (1959) Feb.

The characteristic minimum which occurs in the apparent viscosity-pH curves for oxide slips is explained in terms of the zeta potential of the dispersed oxide. The model adopted also explains a number of other features of the rheological behavior of oxide slips. (auth)

9037

PRELIMINARY STUDY OF THE PHASE EQUILIBRIA DIAGRAM OF ThO_2–SiO_2. L. A. Harris (Oak Ridge National Lab., Tenn.). J. Am. Ceram. Soc. 42, 74-7 (1959) Feb.

A preliminary study of the system ThO_2–SiO_2 supported the premise that the system CaF_2–BeF_2 is a model for this silicate system. The only compound present was the monoclinic form of $ThSiO_4$ (huttonite), which melted incongruently to ThO_2 and liquid at 1975° ± 50°C as determined from a series of powder x-ray spectrometer patterns. The eutectic temperature as tentatively determined is 1700° ± 10°C at a composition of greater than 95% by weight of SiO_2. No solid-solution areas were observed. The quenching samples were fired in a modified oxygen-acetylene furnace which was developed to insure accurate temperature readings and to retain the effects of heating the samples in air. (auth)

9038

A NEW HIGH-PRESSURE FORM OF B_2O_3 AND INFERENCES ON CATION COORDINATION FROM INFRARED SPECTROSCOPY. Frank Dachille and Rustum Roy (Pennsylvania State Univ., University Park). J. Am. Ceram. Soc. 42, 78-80(1959) Feb.

A new crystalline variety of B_2O_3 has been prepared at pressures above 22,000 atmospheres and above 400°C. The properties are listed. These moderate pressures also are sufficient to catalyze the crystallization of the more common hexagonal form from B_2O_3 glass. Pressures, however, of up to 50,000 atmospheres will not convert GeO_2 quartz to GeO_2 rutile at room temperature. From the infrared absorption patterns of appropriate phases it can be shown that in coesite the tetrahedral coordination of Si^{4+} (or Be^{2+} in the model BeF_2-coesite phase) must be unchanged. In the new form of B_2O_3, however, the coordination number must be substantially different from that in the common hexagonal B_2O_3. (auth)

9039

THE CONSTITUTION OF BISMUTH–URANIUM ALLOYS IN THE COMPOSITION RANGE 0-35 ATOMIC PER CENT. URANIUM. P. Cotterill and H. J. Axon (The University, Manchester, Eng.). J. Inst. Metals 87, 159-60(1959) Jan.

The liquidus and solidus relationships obtained by differential thermal analysis of bismuth–uranium alloys in a positive pressure of argon are shown. (auth)

9040

PLUTONIUM. Bernhard Blumenthal (Argonne National Lab., Lemont, Ill.). J. Metals 11, 125-9(1959) Feb.

Information is presented on the use of plutonium as a reactor fuel. Discussions are included on the following: breeding cycles; recovery, toxicity, and properties of plutonium; fuel element assemblies for Experimental Breeder Reactor-II; recycling of plutonium; and fuel pin refabrication. Crystal structure data and transformation temperatures for plutonium phases are included. (J.H.M.)

9041

ELECTRIC PROPERTIES OF THIN LAYERS OF COBALT. F. Savornin and G. Lejeune. J. phys. radium 19, 90S-3S(1958) Dec. (In French)

The variation of the electric resistance of thin films of cobalt vapor deposited on glass supports was studied as a function of time after deposition, temperature, and film thickness. The films were deposited at room temperature and at a temperature of 175°C. The results indicate that cobalt films can be classified into two distinct categories, corresponding perhaps to differences in crystalline structure. (J.S.R.)

9042

ULTRASONIC ENERGY IN PRODUCING FINELY DISPERSED THORIUM BISMUTHIDE. William B. Tarpley, Marvin L. Bromberg, and John G. Thomas (Aeroprojects Inc., West Chester, Penna.). Ind. Eng. Chem. 51, 174-6(1959) Feb.

The results of an exploratory investigation of nucleation and fracture of thorium bismuthide platelets through the use of high-intensity ultrasonic equipment are presented. The intermetallic compound particles so produced are of such size that they may be easily transferred to the bismuth phase from the LMFR blanket for subsequent extraction. The experimental apparatus and techniques are described, and sample photographs are included. (J.R.D.)

9043

URANIUM OXIDE–LIQUID METAL SLURRIES. H. T. Hahn (General Electric Co., Richland, Wash.). Ind. Eng. Chem. 51, 197-9(1959) Feb.

Methods of bismuth–uranium dioxide slurry preparation were investigated. In one case magnesium was added in sufficient quantity to the uranium oxide charge to reduce the oxygen–uranium ratio to 1.6. In another experiment an *in situ* preparation from uranium and bismuth sesquioxide was made. It was concluded that dispersions of uranium oxide in bismuth are fluid at 600°C and may be prepared by either method. The

stability of the slurry increases with oxide concentration due to higher viscosity. A promising method of stabilizing low concentration slurries involves addition of a light metal, such as sodium, to reduce liquid metal density. (J.R.D.)

9044

DIFFUSION IN METALS. Paul Shewmon (Carnegie Inst. of Tech., Pittsburgh). Ind. Eng. Chem. 51, 402-5(1959) Mar.

Diffusion in metals is reviewed in sections on: alloy diffusion, diffusion in pure metals, off-diagonal terms, diffusion in liquids, diffusion of interstitials, and diffusion along surfaces. 106 references. (T.R.H.)

9045

OXIDATION OF METALS. Walter W. Smeltzer and Lyndon H. Everett (Carnegie Inst. of Tech., Pittsburgh). Ind. Eng. Chem. 51, 406-11(1959) Mar.

A review of oxidation of metals including theory, metal oxides, and alloy oxidation is presented. 196 references. (T.R.H.)

9046

CORROSION OF COPPER IN OPEN RECIRCULATING WATER SYSTEMS. J. L. Powell (Union Carbide Nuclear Co., Paducah, Ky.). Ind. Eng. Chem. 51, No. 3, 75A-6A(1959) Mar.

The cause of corrosion in condensers used in the Gaseous Diffusion Process has been investigated. The pitting of copper condenser tubes was caused by a combination of two independent conditions. The presence of copper oxide deposits on the tubes when purchased and their use with a cooling water containing ferrocyanide were the causes of the rapid tube deterioration. The corrosion was not affected by low water velocities nor elevated return water temperatures. Use of a chromate-base water treatment, immediately after discovery of the tube failures, satisfactorily arrested the accelerated attack. (W.L.H.)

9047

POROSITY DETECTION IN MAGNESIUM ALLOYS USING PARAFFIN CONTAINING Pd^{109}. S. M. Makin (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Intern. J. Appl. Radiation and Isotopes 4, 253-5(1959) Jan.

Surface porosity in magnesium alloys has been detected by autoradiography. Pores extending from a surface area of 1.5×10^{-5} cm^2 and within 0.4 mm of the surface can be detected on samples which have been soaked in hot oil containing Pd^{109}. A polished surface and a finish equivalent to 0000 grade emery gave satisfactory autoradiographs, but roughly turned samples were unsuitable. (auth)

9048

NEW TUBING FIGHTS CORROSION, JOINS JACKETS AND LINERS WITH UNBREAKABLE MOLECULAR BONDS. J. B. Ulam (Allegheny Ludlum Steel Corp., Brackenridge, Penna.). Iron Age 183, No. 8, 123-5 (1959) Feb. 19.

Information is presented on a corrosion-resistant tubing that features dissimilar metals metallurgically bonded into an inseparable jacket-and-liner relationship. The new product called "composite tubing" is produced in various combinations of metals and sizes (up to 3 in. OD). The high-strength tube forms were developed by combining two techniques: the Ulan process for cladding metals, and the Ugine-Sejournet method of hot extrusion. The result is true molecular bonding between the oxide-free surfaces of dissimilar materials, as in a carbon steel tube with a stainless steel liner for nuclear reactors. Typical physical and mechanical properties for representative types of carbon-and-stainless composite tubing are presented. In general, the tubing features the excellent mechanical characteristics of stainless steel. It has high strength-ductility and formability, and it can be readily fabricated by welding. (J.H.M.)

9049

THE VACUUM CASTING OF URANIUM. J. Stephenson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inst. Metals 87, 174-80(1959) Feb.

The design of a furnace for melting and casting uranium under vacuum is described, and the experimental work to establish critical points of design and operation is summarized. The furnace is versatile in operation, and a large variety of castings has been made both on a production scale and as single castings. Experience shows that vacuum casting can be both simple and clean and results in an increase in metal purity. (auth)

9050

THE URANIUM–NIOBIUM ALLOY SYSTEM IN THE SOLID STATE. P. C. L. Pfeil, J. D. Browne, and G. K. Williamson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inst. Metals 87, 204-8(1959) Feb.

Niobium and γ-uranium form a continuous series of solid solutions above 950°C. By means of a diffusion couple it has been shown that uranium diffuses more rapidly than niobium, with a diffusion coefficient at 850°C of the order of 10^{-10} $cm.^2$ sec^{-1}. The lattice-parameter/composition curve obtained from quenched alloys extrapolates to 3.51 A. for γ-uranium, compared with the accepted value of 3.47 to 3.48 A from high-temperature x-ray measurements extrapolated to room temperature. There is a miscibility loop ($\gamma_1 + \gamma_2$) between a monotectoid at 13.3 ± 1 at. % niobium and 68 ± 2 at. % niobium at 650 ± 5°C. The maximum occurs at ~50 at. % at 950 ± 10°C. The loop apparently shows a kink on the uranium-rich side near 700°C. The solubility of niobium at the peritectoid temperature of 667 ± 5°C is approximately 0.8 at. % in β-uranium and 1.6 at. % in α-uranium. The maximum solubility in β-uranium increases to between 1.5 and 2.0 at. % at 710 to 730°C. Extreme nucleation difficulties were encountered within part of the ($\gamma_1 + \gamma_2$) loop and immediately below the monotectoid, and special treatments were necessary to reach equilibrium. The positions of the phase boundaries are compared with those given by other workers. The immiscibility loop is attributed to strain energy and is discussed with reference to other heavy-element alloy systems. (auth)

9051

CORROSION OF ALUMINIUM UNDER CONDITIONS ENCOUNTERED IN NUCLEAR REACTORS. A. Domony. Kohaszati Lapok 90, 542-50(1957).

Pure Al and its alloys containing various amounts of Fe, Si, and/or Ti were subjected to 1 to 6 cycles consisting of 8 hr exposure to steam at 180°C and cooling for 16 hr. The exposed samples were examined for tensile, microscopic x-ray, and chemical properties. Al containing small amounts of Si and Ti will corrode in relation to the temperature of the aqueous phase; at 180°C corrosion begins after a few hours incubation, at > 260°C within a few minutes; > 0.2% Fe will substantially inhibit corrosion at 180°C (> 0.3% at 260°C); > 0.4% Si, if no Fe is present, will prevent corrosion; 0.2% Ti will be effective at 180°C but not at 260°C. B

will accelerate corrosion unless Si is also present; in the latter case it shows no appreciable effect. Corrosion proceeds inwards along the crystal boundaries and is attributed to the water (which is dissociated at high temperature and pressures) in that the H ions will peptize the oxide layer at the surface which, in the absence of air, is unable to be regenerated. The depolarizing effects of the various ingredient metals, depending upon the potential differential, are of major effect in inhibiting or accelerating corrosion. (auth)

9052

THE RAPID DETERMINATION OF BERYLLIUM OXIDE IN BERYLLIUM METAL. A. R. Eberle and M. W. Lerner (U. S. Atomic Energy Commission, New Brunswick, N. J.). Metallurgia 59, 49-52(1959) Jan.

A rapid method of determining beryllium oxide in beryllium metal is presented. Samples of vacuum-cast or thermal-reduction metal powder or fine chips are dissolved in a methanol-bromine solution. Dissolution of resistant particles is completed by a methanol-hydrochloric acid solution. Electrolytic metal samples require a preliminary heat treatment before dissolution. Beryllium oxide in the undissolved residue is determined colorimetrically or volumetrically. Conditions were chosen to yield the same results as those obtained with the hydrogen chloride volatilization method. (auth)

9053

PROPERTIES OF ZIRCALOY-2. L. S. Rubenstein (Westinghouse Electric Corp., Pittsburgh). Nucleonics 17, No. 3, 72-6(1959) Mar.

A data compilation summarizing present knowledge of the composition and corrosion, mechanical, and physical properties of Zircaloy-2 is presented. (T.R.H.)

9054

DEVELOPMENT OF TITANIUM-CLAD STEEL USING A VACUUM-BRAZING PROCESS. D. Canonico and H. Schwartzbart (Illinois Inst. of Tech., Chicago). Welding J. (N. Y.) 38, 71s-7s(1959) Feb.

A method is described for producing titanium-clad steel by a patented sandwich vacuum-brazing procedure. The brazing parameters such as filler-metal composition, brazing cycle, degree of vacuum, and surface preparation methods were investigated. The strongest claddings (shear strength > 20,000 psi) were produced using BAg8 brazing alloy (the silver-copper eutectic composition) at its lowest possible brazing temperature (1460 to 1500°F). Procedures and joint designs for making sound ductile weldments in the clad plate were developed. (auth)

9055

METHODS FOR END CAPPING ZIRCONIUM-CLAD REACTOR FUEL PINS. J. J. Vagi, R. L. Koppenhofer, and D. C. Martin (Battelle Memorial Inst., Columbus, Ohio). Welding J. (N. Y.) 38, 78s-84s(1959) Feb.

As part of a development program conducted for Atomic Power Development Associates, several methods for attaching end caps to fuel pins were studied. The method providing the best seal involved the use of a fuel pin in which the core was recessed to receive an end-cap insert that was attached and sealed by arc welding. The strength of the resulting end cap-to-fuel pin joint was low because all loading was supported only by the 4-mil thick cladding. Resistance-upset butt welding using sleeves to limit outward upset gave the strongest end cap-to-fuel pin joints. However, contamination of the fuel-pin surface or exposure of the core alloy at the weld joint was observed in nearly every joint made by resistance welding. The joint design giving most consistent results was one in which the fuel pin was beveled slightly and welded to a flat end cap. Very little end preparation of the fuel pins was required for resistance welding. Of the other methods explored, the mechanical attachment of end caps by a recessed-joint design and a grooved end-cap insert, offered some promise. With this type of joint design only a mechanical seal is formed and only about half the strength of end caps attached by arc welding was obtained. (auth)

9056

PENETRATION DEPTH AND THE DISTRIBUTION OF ATOMS INJECTED INTO A Si^{30} ISOTOPE TARGET. M. I. Guseva, E. V. Inopin, and S. P. Tsytko (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 3-9(1959) Jan. (In Russian)

The penetration depth and distribution of silicon atoms injected in tantalum and copper backings were investigated. The targets which were prepared in an electromagnetic separator by direct precipitation of the Si^{30} isotope on the backing were bombarded by protons accelerated in an electrostatic generator. The shape of the resonance yield of γ rays from a single γ resonance in the $Si^{30}(p,\gamma)P^{31}$ reaction was observed in four targets and compared with the theoretical density distribution of the injected atoms. The penetration depth and nature of the distribution of the Si^{30} atoms injected in the tantalum backing satisfactorily agree with the theory. (tr-auth)

9057

EQUILIBRIUM OF CARBON WITH LIQUID ALLOYS OF Fe, Mn, Si, AND C. M. S. Petrushevskii and P. V. Gel'd. Zhur. Priklad. Khim. 32, 86-94(1959) Jan. (In Russian)

Studies were made of the solubility of carbon in manganese and alloyed Fe and Si at 1460°C. (R.V.J.)

9058

PROGRESS IN NON-DESTRUCTIVE TESTING. Volume 1. E. G. Stanford and J. H. Fearon, eds. London, Heywood & Company, Ltd., 1958. 270p.

Six papers are presented on non-destructive testing. Separate abstracts have been prepared for each paper. (W.L.H.)

9059

RECENT DEVELOPMENTS IN INDUSTRIAL RADIOGRAPHY: FLUOROSCOPY AND SCREEN-INTENSIFICATION PROCESSES. R. Halmshaw (Armament Research and Development Establishment, Ministry of Supply, Fort Halstead, [Eng.]). pp. 3-31 in "Progress in Non-Destructive Testing, Volume 1."

The experimental work on the sensitivity limits attainable in fluoroscopy and with one form of image intensifier and the factors limiting the attainable performance with these methods together with the likelihood of future progress in this field are summarized. The limitations on sensitivity in both fluoroscopy and image-intensifier systems, imposed by the effects of quantum fluctuations in the x-ray beam, are also discussed. (W.L.H.)

9060

STRESS WAVE PROPAGATION AS APPLIED TO THE DETECTION OF FLAWS BY ULTRASONIC INSPECTION. D. G. Christie (Aluminium Labs., Ltd., Banbury, Eng.). pp. 35-56 in "Progress in Non-Destructive Testing, Volume 1."

Some of the theoretical ideas required for an understanding of the propagation, reflection, refraction, and scattering of stress pulses in solid and liquid media are discussed with particular reference to ultrasonic flaw detection. (W.L.H.)

9061
ELECTROMAGNETIC METHODS OF TESTING METALS. R. Hochschild (Metrol Inc., Pasadena, Calif.). pp. 59-109 in "Progress in Non-Destructive Testing, Volume 1."

The testing of all types of metals, including ferromagnetic, by means of alternating magnetic fields is discussed. These methods are also commonly referred to as eddy current methods. The theoretical ideas underlying the new developments are discussed. (W.L.H.)

9062
THE APPLICATIONS OF DAMPING CAPACITY FOR INVESTIGATING THE STRUCTURE OF SOLIDS. R. W. B. Stephens (Imperial Coll. of Science and Tech., London). pp. 167-98 in "Progress in Non-Destructive Testing, Volume 1."

The methods of measuring damping capacity are reported. The causes of damping are presented in detail. The phenomena which can be investigated by damping capacity measurements are described. The application of damping capacity measurements to the investigation of the characteristic properties of some specific types of materials is presented. (W.L.H.)

9063
THERMAL CONDUCTIVITY AS A NON-DESTRUCTIVE TESTING TECHNIQUE. R. W. Powell (National Physical Lab., Teddington, Eng.). pp. 201-26 in "Progress in Non-Destructive Testing, Volume 1."

Methods for non-destructive testing of solid materials by the use of thermal conductivity are reported. (W.L.H.)

9064
NUCLEAR MAGNETIC RESONANCE AND ITS APPLICATION TO THE TESTING OF MATERIALS. L. E. Drain (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 229-63 in "Progress in Non-Destructive Testing, Volume 1."

The most important applications of nuclear magnetic resonance to non-destructive testing are in the analysis of materials for isotopes, elements, or compounds or for a component in a particular state. The study of nuclear resonance line widths gives information about crystal structure and molecular motion; in metals, the conduction electrons play an important role and information may be obtained about the electronic structure of metals. The principle of magnetic resonance may be employed wherever one is concerned with particles which possess both angular momentum and magnetic moment. (W.L.H.)

9065
LIQUID METALS AND SOLIDIFICATION. A Seminar on Liquid Metals and Solidification Held During the Thirty-Ninth National Metal Congress and Exposition, Chicago, November 2 to 8, 1957, Sponsored by The American Society for Metals. Cleveland, American Society for Metals, 1958. 350p.

The papers presented at this seminar include: The Theory and Structure of Liquids; Transport Properties in Pure Liquid Metals; Thermodynamics and Properties of Liquid Solutions; Nucleation in the Solidification of Metals; Solid Metal–Liquid Metal Reactions in Bi and Na; Discussion of Weeks and Gurinsky paper on Solid Metal–Liquid Metal Reactions in Bi and Na; Some Aspects of the Mechanism of Metal Deposition and Dissolution; Mechanism of Growth; Thermal Considerations of Freezing; Redistribution of Solute During Freezing; Imperfections Resulting from Solidification; Polyphase Solidification; and Structure of Ingots and Castings. (W.L.H.)

9066
MATERIALS FOR ROCKETS AND MISSILES. Robert G. Frank and William F. Zimmerman. New York, The Macmillan Company, 1959. 140p. $4.50.

Engineering data are presented on lightweight, high-temperature materials for rocket and missile applications. The physical and mechanical properties of Fe-, Ni-, and Co-base sheet, wrought, and cast alloys are presented. The physical and mechanical properties of wrought and cast alloys of Al and Mg are reported. The physical and mechanical properties of Ti alloys, Mo alloys, cermets, and ceramics are presented. (W.L.H.)

9067
METALLURGICAL THERMOCHEMISTRY. O. Kubaschewski and E. LL. Evans. New York, Pergamon Press, 1958. 437p.

The necessary theoretical basis is discussed in the first part. This section consists essentially of the formulas necessary for applying the fundamental data to reaction problems. The second part describes the main experimental techniques used to determine the thermochemical data. In the third part, some methods are described of estimating values which for some reason have not been or cannot be determined. The fourth part contains in a few tables the values of thermochemical constants for a large number of elements and compounds of possible metallurgical importance. The final part contains a few examples of practical applications of thermochemical methods. (W.L.H.)

PARTICLE ACCELERATORS AND HIGH-VOLTAGE MACHINES

9068 AERE-A/R-2626
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
THE 7 GEV PROTON SYNCHROTRON MAGNET: GENERAL CHARACTERISTICS OF MODEL AC2. D. A. Gray, A. H. Spurway, and J. J. Wilkins. Nov. 1958. 22p.

Magnet model A.C. 2 is described, and measurements of its general characteristics under d-c and pulsed excitation are reported. For these preliminary measurements the model was fitted with plane, parallel pole-pieces (n = 0 field law). (auth)

9069 AERE-NP/R-2768
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
RADIOACTIVITY OF SYNCHROCYCLOTRON COOLING WATER. B. Rose, B. A. Goddard, B. A. Loveridge, L. Salmon, and A. M. Thomas. Oct. 1958. 6p.

The cooling water for the dee of the Harwell synchrocyclotron has been found to be active, producing radia-

tion levels up to 100 mr/hour on various parts of the cooling system. From the characteristics of the radiation and radiochemical studies, the activity is tentatively assigned to O^{15} and C^{11} produced by spallation reactions on the O^{16} of the cooling water. The implications of this result are briefly discussed. (auth)

9070 CERN-58-29
European Organization for Nuclear Research, Geneva.
ETUDE D'UN BETATRON A CHAMP ACCELERATEUR ELEVE. (Study of a Betatron with High Acceleration Field.) P. Gratreau and Ch. Maisonnier. Dec. 1958. 22p.

A method of calculating the profile of a coil of a betatron with high accelerator field is developed and applied to the study of an air-core betatron. (J.S.R.)

9071 CERN-59-1
European Council for Nuclear Research, Geneva.
SUR LE CHAMP DE FUITE DES DEFLECTEURS MAGNETIQUES FORME DES FACES MAGNETIQUES, CORRECTION DES ABERRATIONS. (The Leakage Field of Magnetic Deflectors. Shape of Magnetic Fronts, Correction of Aberrations.) A. Septier. Dec. 1958. 32p.

The leakage fields of the extremities of the magnetic deflectors can be taken into account by defining an effective length d on the mean trajectory. In a magnet with pole pieces sufficiently large, the imaginary magnetic fronts of entry and outlet are planar in the useful zone because d is constant. However, the narrowing of the pole pieces causes the deformation of this front. In the case where the magnetic fronts are planar and normal to the direction of the mean trajectory, the magnetic fronts are curved and possess at each point two equal and opposed curvatures. Their section by the median plane of the air gap is a convex curve towards the exterior. One can correct this curvature by giving to the mechanical face an equal and opposite curvature; the approximation obtained with the aid of plane faces is sufficient. When the correction of the aberration of the second order necessitates the use of curved mechanical faces, the parasite effect must be considered in the calculation of the curvature radius. For the deflectors of the CERN, the double curvature of the face leads to troublesome aberrations much stronger than the abberrations of the second order. In the case where the mechanical faces are inclined by an angle α_ϕ on the direction of the same trajectory ("vertical" focusing), the magnetic fronts have a weaker average inclination. The "drag" $\Delta\alpha$ increases very rapidly with α_ϕ, and causes a distortion of the magnetic faces. The correction of the flaw is possible with appropriate correctors, and for a given magnet a method of correction can generally be perfected for all used values of α_ϕ. (tr-auth)

9072 INSJ-14
Tokyo Univ. Inst. for Nuclear Study.
ON THE FOCUSING SYSTEM OF THE INS CYCLOTRON. Kazuhisa Matsuda, Takashi Mikumo, Keigo Nisimura, Shinsaku Kobayashi, Hirotsugu Ogawa, and Hitoshi Adachi. Jan. 15, 1959. 26p.

The design and the construction of the focusing system for the INS 160-cm cyclotron are described. In order to fulfill the requirements of the variable energy external beam and to facilitate various experimental arrangements, a combined lens of a pair of quadrupole magnets and a sector magnet was constructed. An analysis of the focusing properties of quadrupole magnets is described. (auth)

9073 MURA-443
Midwestern Universities Research Assn., Madison, Wis.
THE NON-LINEAR COUPLING RESONANCE $2\nu_y-\nu_x = 1$. L. Jackson Laslett. Jan. 2, 1959. 31p. Contract AT(11-1)-384. $1.00(OTS).

Computational results, obtained with the DUCK-ANSWER program and pertaining to the $2\nu_y-\nu_x = 1$ resonance, are reported for two examples of coupled Hamiltonian differential equations. Each of the examples contains a term involving $x \cdot y$ (with a periodic coefficient) in the y-equation. The width of the resonance appears in each case to be roughly proportional to the first power of the x-amplitude. Results are also presented to show the effect, on the y-motion, of traversing the $2\nu_y-\nu_x = 1$ resonance, at various rates. A rough analytic examination of the second set of equations is also given. Comparisons with the computational results suggest the theory to be semi-quantitatively valid. (auth)

9074
MOTION OF CHARGED PARTICLES IN THE CENTRAL REGION OF A CYCLOTRON. V. S. Panasyuk. J. Nuclear Energy 8, 256-9(1959) Jan.

Measurements conducted on 15-Mev deuterons in a cyclotron showed that the beam current in the final orbit is some 150 times less than the ion current leaving the source. Calculations based on theoretical work indicate that the ion losses should not reduce the current by more than a factor of fifteen. A method for minimizing this discrepency between theory and experiment is suggested. (A.C.)

9075
HIGH RESOLUTION NEUTRON TIME-OF-FLIGHT EXPERIMENTS USING THE HARWELL 15 Mev LINEAR ELECTRON ACCELERATOR. F. W. K. Firk, G. W. Reid, and J. F. Gallagher (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Instr. 3, 309-15(1958) Dec.

A technique is described for producing neutron pulses of 0.25 μsec duration at 400 pps. The electron gun of the Harwell 15 Mev linear accelerator is pulsed from an external modulator during the period of the normal radio frequency pulse of 2 μsec duration. Using timing channels of 0.2 μsec duration and a flight path of 31.8 m a nominal resolution of 8 mμsec m^{-1} is obtained. The neutron output during the 0.25 μsec pulse is approximately 60% of the output obtained when using the normal 2 μsec electron pulse. Total cross section measurements using a bismuth sample demonstrate the improved resolution in the energy region of 10 to 20 kev. (auth)

9076
THE PRETORIA CYCLOTRON. J. J. Burgerjon, S. J. Du Toit, and C. A. J. Kritzinger (National Physical Research Lab., Pretoria). Nuclear Instr. 3, 323-35(1958) Dec.

A brief technical description of the Pretoria fixed frequency cyclotron is given. It is a 112 cm machine which at present accelerates internal deuteron beams of 200 microamperes to 15 Mev. Interesting features are a double ion source and automatic target removal and dispatch mechanism. (auth)

9077
FUNCTION OF THE COLLECTING ELECTRODE IN A VAN DE GRAAFF GENERATOR. K. S. Subudhi (Banaras Hindu Univ., India). Nuclear Instr. 3, 341-3(1958) Dec.

In the Van de Graaff electrostatic generator the electric charge at a high voltage is stored on a metallic

collecting electrode. The spherical collecting electrode is similar to a Faraday's icepail. A new explanation of the generation of the high voltage in the above generator was presented in 1954. It is based on a different fundamental principle, namely, the Volta's condensing electroscope principle. Simon concluded that if the spraying system is maintained at a constant potential, the collecting electrode will also attain a constant potential, the magnitude of which will be proportional to that of the spraying system. The factor of proportionality does not depend on the capacity of the collecting electrode but depends on the height of the machine. The results of the experiments performed on a self-exciting generator of Becker type indicate that the voltage of the generator does not depend on the metallic sphere and the voltage is increased as the height is increased even though the same collecting system is used. This is qualitatively in accordance with the Simon's theory. (auth)

9078

LOW-ENERGY ACCELERATORS FIND MORE TO DO. Nucleonics 17, No. 3, 116-20(1959) Mar.

Applications for low-energy accelerators are discussed in sections on: multistage accelerators, neutrons in oil geology, low energies in physics, and accelerators for biology. (T.R.H.)

9079

SPACE-CHARGE EFFECTS IN ELECTRON-SYNCHROTRONS. C. Bernardini (Istituto Nazional di Fizica Nucleare, Frascati, Italy). Nuovo cimento (10) 10, 804-16(1958) Dec. 1.

Space charge effects are considered (taking into account positive ions) with the aim of deciding whether they can set up serious intensity limitations for the beams of weak focusing electron synchrotrons. The possibility of linear resonances and non linear beam splitting is shown. An estimate of the rate of production of positive ions in the doughnut is given. (auth)

9080

LONGITUDINAL SPACE CHARGE EFFECTS IN PARTICLE ACCELERATORS. C. E. Nielsen and A. M. Sessler (Ohio State Univ., Columbus and Midwestern Universities Research Assn., Madison, Wis.). Rev. Sci. Instr. 30, 80-9(1959) Feb.

The modification of the single particle theory of particles subject to radio-frequency acceleration caused by electrostatic repulsion between particles is calculated. With the aid of an appropriate Hamiltonian the Boltzmann equation is reduced to a one-dimensional integral equation for the case of a uniform particle density in a limited region of phase space. For a range of parameters that includes most accelerators, this equation is approximated by an algebraic equation, and an analytic solution valid below the transition energy is obtained. Computations are given of the "longitudinal space charge limit," as well as the effect of space charge on the azimuthal bunching of a beam by an accelerating cavity. Numerical examples of these two effects are given. (auth)

9081

QUANTUM CORRECTIONS FOR RELATIVISTIC RIGID ROTATOR EMISSION. L. V. Iogansen (Moscow State Pedagogical Inst.). Zhur. Eksptl'. i Teoret. Fiz. 36, 313-14(1959) Jan. (In Russian)

Modified quantum corrections for electron emission in a synchrotron show that calculations completely disregarding excitations of betatron oscillations and considering the electron as an absolute rigid rotator produce results practically identical with published data. The characteristics of forces securing such rigid focusing are not qualified, and the possible interactions of the electron spin with focusing fields are not considered. (R.V.J.)

9082

ACCELERATORS OF IONS AND ELECTRONS. Principles and Basic Calculations of Linear and Circular Accelerators. Čestmir Šimáně. Prague, Artia, [1958]. 191p.

The principals of action, important calculations, and constructional details of accelerators, linear as well as circular types, of ions and electrons are explained. A description of auxiliary equipment, its operation, and an illustration of a practical utilization of accelerators are described. The book is intended for designers of electronic and ionic apparatus, research workers, and university students. (W.D.M.)

PHYSICS AND MATHEMATICS

General

9083 AD-209373

Brown Univ., Providence. Metals Research Lab.
SCATTERING OF ELASTIC WAVES IN ISOTROPIC MEDIA BY SPHERICAL OBSTACLES. Norman G. Einspruch and Rohn Truell. Dec. 1, 1958. 109p. Contract DA-19-020-ORD-4581.

The method of Ying and Truell for studying the scattering of compressional elastic waves by simple spherical obstacles was applied to the analysis of scattering of compressional elastic waves by a fluid-filled cavity and by layered obstacles in which the core of the layered scatterer is a cavity, a rigid sphere, a fluid-filled cavity, or an elastic material of properties different from those of the surrounding medium. A general expression of the scattering cross-section offered to a compressional wave was derived. A similar analysis was made of the scattering of transverse elastic waves. An appendix contains an evaluation of some definite integrals involving associated Legendre polynomials. (auth)

9084 AECU-3989

Washington Univ., St. Louis.
SOME EXPERIMENTS ON ELECTRICAL CONDUCTION IN VACUUM. Joseph W. Kennedy, Ernest A. Bryant, Ulrich Merten, Preston V. Murphy, and Edmund K. Storms. Dec. 1957. 65p. Project No. 8. Contract AT(11-1)-85. $1.75(OTS).

The conduction of electricity through a vacuum was investigated in high voltage generators using beta emitters as current sources. The voltage attained by the generators was limited by vacuum conduction to values of tens to a few hundreds of kilovolts. The leakage current responsible for this limitation in most cases was found to consist of an exchange of charged particles between the two electrodes. The adsorption of contaminants on electrode surfaces was found to decrease the voltage at which appreciable vacuum conduction began to occur. In the systems studied, less than a monolayer of a slightly volatile material adsorbed on the anode surface had a marked effect. The nature of the positive particles was investigated by a mass spectrometric technique, and the secondary production coefficients involved in the exchange were studied. (auth)

9085 AECU-4019

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

THE DIFFUSE X-RAY SCATTERING IN POWDER PATTERNS ARISING FROM STATIC DISPLACEMENTS IN CUBIC SOLID SOLUTIONS. C. R. Houska and B. L. Averbach. [1958?]. 15p. $3.30(ph), $2.40(mf) OTS.

The diffuse scattering arising from static atomic displacements from the average lattice sites was evaluated for cubic powder patterns. This excess scattering results from elastic interactions between atoms of different size in binary solid solutions, and is compatible with the conservative intensity loss of the main reflections. The resultant scattering was found to take the form $I_s = \overline{f}^2 H(x) (1-e^{-2M'(x)})$, where H(x) is a weak modulation which varies by approximately 10% about unity. (auth)

9086 AECU-4032

Illinois. Univ., Urbana. Digital Computer Lab.

A SET OF BASIC CIRCUITS. Report No. 86. Gene H. Leichner. Oct. 21, 1958. 38p. Contract AT(11-1)-415. $6.30(ph), $3.00(mf) OTS.

Most of the problems in present logical circuits for computers arise from the fact that the AND and OR circuits are non-restoring in nature. Each circuit may contribute a level shift due to tolerances within the circuit or to external load differences. A set of circuits is presented which represents a somewhat different viewpoint. Every circuit restores the output signal to a standard condition. In general, rather than placing diode logic or level changing resistors after emitter follower inputs, as the present circuits do, these circuits have diode logic at their inputs following by a restoring circuit. (W.D.M.)

9087 AECU-4033

Illinois. Univ., Urbana. Digital Computer Lab.

FLOW-GATING I. Report No. 83. W. J. Poppelbaum. July 10, 1958. 15p. Contract AT(11-1)-415. $3.30 (ph), $2.40(mf) OTS.

The simple problem occurring in a computer of transferring a zero or a one from one place to another in a selective fashion is considered by discussing the transmission of information from one Eccles-Jordan flipflop to another. It is assumed that non-overlapping voltage bands represent the zero and one signals, the bands being caused by parameter drift. (W.D.M.)

9088 AECU-4045

Illinois. Univ., Urbana. Engineering Experiment Station.

THE DIELECTRIC TUBE RESONATOR—A SLOW-WAVE, OPEN BOUNDARY, DIELECTRIC RESONATOR FOR THE GENERATION AND MEASUREMENT OF MILLIMETER AND SUB-MILLIMETER WAVELENGTH ELECTROMAGNETIC RADIATION. Technical Report No. 2. R. C. Becker. Jan. 23, 1959. 346p. Contract AT(11-1)-392. $53.10(ph), $11.10(mf) OTS.

The yet unsolved submillimeter wavelength problem, namely, providing a source of high-power, coherent, monochromatic signal frequencies in the region 300 to 3000 kmc/s, together with suitable measuring techniques and devices, is considered. The dielectric tube resonator is proposed to deal with this problem. It consists of a hollow, circularly cylindrical tube of dielectric material suitably terminated at its ends by sufficiently large metal end walls and constitutes a slow-wave, open-boundary, higher order mode resonator. (W.D.M.)

9089 AERE-C/R-2772

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE RESISTANCE TO LEACHING OF SOME GLASSES AND CERAMICS CONTAINING STRONTIUM. C. B. Amphlett and P. J. Jones. Jan. 1959. 18p. $0.42 (BIS).

Leaching tests with water and acids on a variety of glasses and ceramics based on the oxides SrO, Na_2O, B_2O_3, Al_2O_3, SiO_2, and TiO_2 are described. On the basis of a broad general survey of the field, an attempt is made to select areas deserving further study from the viewpoint of trying to prepare strontium sources for irradiation purposes. (auth)

9090 AFOSR-TN-58-1136

Pennsylvania State Univ., University Park. Field Emission Lab.

STUDY OF METAL SURFACES BY THE FIELD EMISSION MICROSCOPE. Technical Report No. 9. Russell D. Young. Dec. 1958. 51p. Contract AF18(600)-672. (AD-208085).

An investigation was initiated in order to employ the energy distribution of field-emitted electrons as a means of studying the electronic band structure in metals and semiconductors. When the energy analyzer was improved in order to carry out this study, the measured energy distribution was much narrower than that predicted by the existing normal-energy distribution theory. Further investigation revealed that the retarding potential energy analyzer which was employed measures the total electron energy rather than the energy associated with the component of velocity normal to the surface. The Fowler-Nordheim equation was derived in a new way in order to preserve the distribution in total energy of field emitted electrons. A similar derivation was carried out for thermionic emission. A striking mirror image symmetry was found between the normal-energy thermionic emission and the total-energy field emission energy distributions. A similar symmetry was noted between the total-energy thermionic and normal-energy field emission energy distributions. Further analysis indicated that the widths of the energy distributions in field- and thermionic emission are the same. This means that field emission and thermionic emission are now known to be on an equal footing in cases where energy distribution contributes to vacuum tube noise or to chromatic aberration in electron optics. Energy distribution measurements at liquid hydrogen, liquid nitrogen, and room temperatures were found to be in excellent agreement with the new theory. The resolution of the analyzer was 0.03 ev. Half-widths as narrow as 0.15 ev were measured and the temperature tail of the Fermi-distribution could be detected down to 77°K. A preliminary measurement of the total-energy distribution of thermionically emitted electrons was also carried out. (auth)

9091 APEX-428

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

SHIELDING COMPUTER PROGRAMS 01-0, 02-0, AND 03-0; REACTOR SHIELD ANALYSIS. M. A. Capo, W. E. Edwards, and J. E. MacDonald. Aug. 15, 1957. 63p. Contracts AF33(600)-38062 and AT(11-1)-17. $1.75(OTS).

Programs for calculating direct-beam fast neutron and gamma dose rates in and around cylindrical shield

regions coaxial with cylindrical source regions were coded for the IBM 701 digital computer. A program for computing the weight of a reactor-shield assembly also was coded. Components of the IBM 701 computer required for these programs include two memory frames, one magnetic drum, and two tape units. Instructions for using these programs and input data for a sample problem are given. (auth)

9092 APEX-448
Internuclear Co., Inc., Clayton, Mo.
THE ACTIVITY OF THE FISSION PRODUCTS OF U^{235}. W. E. Knabe and G. E. Putnam. Oct. 31, 1958. 89p. For General Electric Co. Aircraft Nuclear Propulsion Dept. Contracts AF33(600)-38062 and AT(11-1)-171. Subcontract AT-118. $2.25(OTS).

Energy distributions and energy release rates of fission product gammas and energy release rates of the fission product betas are presented in tabular and graphical form, and the computation methods are outlined in detail. The data given for beta and gamma decay rates pertain directly to the thermal fission of U^{235}. The possible effects of neutron energy spectra, other than thermal, and neutron flux level upon the fission product decay rates were examined, and the results are reported. The importance of bremsstrahlung caused by beta particles from fission products and the effect of photoneutron production due to the photonuclear reactions of the fission product gammas with D or Be were studied. Methods of evaluating these effects in the reactor are briefly described. (J.E.D.)

9093 APEX-463
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
THERMAL STRESS IN TUBE WITH AXIAL TEMPERATURE GRADIENT. R. J. Dunholter. Oct. 1957. 25p. Contracts AF33(600)-38062 and AT(11-1)-171. $1.00 (OTS).

A method for calculating the stresses in a thick-walled tube subjected to a purely axial distribution of temperature, including a one-term correction for the self-equilibrating end stress, is described and applied to a tube of one size under two different static-temperature distributions. (auth)

9094 ARDE-(B)-46/57
Gt. Brit. Armament Research and Development Establishment, Fort Halstead, Kent, England.
AN APPROXIMATE SOLUTION OF THE ONE-DIMENSIONAL TRANSPORT EQUATION. M. G. Smith. Aug. 1957. 13p.

An approximate method for obtaining a solution of the simplest form of the transport equation is described. The approximation is of the diffusion type, but it incorporates fitting certain parameters by least squares, and so, it is hoped, gives better solutions than the straightforward approximation of this type. A numerical solution is exhibited for a simple case, and this shows features characteristic of diffusion solutions, but gives a good qualitative and quantitative solution. (auth)

9095 CEA-814
France. Commissariat à l'Énergie Atomique, Paris.
PRODUCTION DE PHOTONS DE SPECTRE ÉTROIT À PART IR D'ÉLECTRONS DE GRANDE ÉNERGIE. (Production of Photons with a Narrow Energy Spectrum, Starting from High Energy Electrons.) C. Tzara. Mar. 1958. 19p.

A method for the production of photons with a narrow spectrum and of variable energy, based on the properties of the annihilation-in-flight of positrons, is examined in detail. The spectrum of the photons produced and the yield of the process are given for various conditions. (auth)

9096 CEA-839
France. Commissariat à l'Énergie Atomique, Paris.
EMPILEMENT POUR LE CONTRÔLE DE L'ABSORPTION DU GRAPHITE E.C.A.G. (An Experimental System for the Checking of the Absorption of E. C. A. G. Graphite.) V. Raievski and R. Vidal. May 1958. 25p.

A system is described for measuring the mean absorption cross section of graphite for the thermal neutrons. This system consists of a graphite stack containing a Ra—Be source and a BF_3 counter. A cavity in the stack receives the graphite to be studied or the graphite standard. By comparing the counting rates, their absorption ratio can be deduced. The measurement is performed on graphite rods which are machined before being placed in the pile. It provides the possibility of detecting in a batch of 1 ton of graphite, in a single measurement, a difference in absorption of 0.1 millibarn. (auth)

9097 CF-58-10-14
Oak Ridge National Lab., Tenn.
SOL: AN ORACLE CODE FOR THE SOLUTION OF CERTAIN SECOND ORDER LINEAR PARTIAL DIFFERENTIAL EQUATIONS. F. J. Witt. Mar. 13, 1959. 17p. Contract W-7405-eng-26. $3.30(ph), $2.40(mf) OTS.

This report describes in detail the numerical solution of a second-order linear partial differential equation of the form

$$\frac{\partial \eta(x,t)}{\partial t} = A(x)\,\frac{\partial^2 \eta(x,t)}{\partial x^2} + \left[\frac{g}{x} + B(x)\right]\frac{\partial \eta(x,t)}{\partial x} + C(x)\,\eta(x,t) + D(x,t)$$

with two point boundary conditions and zero initial condition. An ORACLE code is described which solves this equation for $D(x,t) = D(x)$, and it is shown that this code may be used to solve the differential equation $A(x)\,\eta'' + B(x)\,\eta' + C(x)\,\eta + D(x) = 0$ with two point boundary conditions. (auth)

9098 FZM-913A
Convair, Fort Worth, Tex.
REACTOR SHIELD PENETRATIONS. R. L. French. [1958]. 26p.

For presentation at Annual Meeting of Health Physics Society, Berkeley, Calif., June 9-11, 1958.

Differential energy spectra in various media for point isotropic sources of monoenergetic gamma radiation were obtained by a moments method solution of the Boltzmann transport equation. These data are utilized in a method developed for calculating gamma spectra and dose rates from nuclear reactors. An elemental volume of the reactor core is considered as a point isotropic source of gamma radiation with a spectrum which is defined at several energy levels. After penetration of each shield layer the modified spectrum is calculated and used as a source term for penetration of the next layer. For each iteration the calculation involves an integration over the source spectrum for each of the defined energy levels. After penetration of the final shield layer an integration is performed over the volume of the reactor core. Dose rate is obtained by applying the appropriate response function and performing an integration over the energy range. Results ob-

tained with this method agree with BSF centerline dose rates, for example, within 10% out to 120 cm in water and within 30% out to 380 cm in water. (auth)

9099 KAPL-1904
Knolls Atomic Power Lab., Schenectady, N. Y.
CORRELATION OF EXPERIMENTAL DATA WITH THEORY FOR PERFORATED PLATES WITH A TRIANGULAR HOLE ARRAY. L. Deagle. Jan. 7, 1958. 65p. Contract W-31-109-Eng-52. $2.00(OTS).

The design of the S3G and S4G reactor pressure vessel heads led to a study of perforated plates. A correlation of perforated plate theory with experimental data is given. The test results and analysis used for the S3G model tests are presented along with a review of two other experimental programs in which the experimental data were correlated theory. The conclusions reached indicate that the perforated lattice does, in fact, behave as an equivalent plate of reduced stiffness when subjected to transverse loading. The results obtained from the theory are sufficiently accurate for engineering applications for a range of plate sizes which extends from thin plates (radius-to-thickness ratio 7.5 to 1 for Duncan's tube sheets) to thick plates (radius-to-thickness ratio 1.6 to 1 for the reactor model head) with a variation in the number of penetrations ranging from the large number in Duncan's tube sheet tests down to the relatively small number (19 holes) in the reactor model head (3/8 scale model). (auth)

9100 KAPL-1961
Knolls Atomic Power Lab., Schenectady, N. Y.
THE WORTH OF SINGLE CONTROL RODS IN HYDROGENOUS REACTORS. D. R. Bach and M. E. Way. July 28, 1958. 35p. Contract W-31-109-Eng-52. $1.00(OTS).

Information contained in this report originally issued as KAPL-M-DRB-2.

Reactivity measurements of the worth of single slab-type control rods fabricated from a variety of materials were made in five Flexible Plastic Reactor assemblies. These assemblies cover what is believed to be a reasonable spectral range for hydrogen-moderated reactors ($\beta\gamma$ = 0.08 to 0.71). An analysis of these experiments shows that the relative worths, which are sensitive functions of the spectrum, can be described by a two-group absorption area scheme. The measured ratio of the worth of an absorber having complicated resonances to that of a simple material with a slowly varying cross section is used to evaluate the epithermal transmission probability of the former. It is shown that when this parameter is used to calculate the relative worth in a different spectrum, good agreement with experiment is obtained. That is, in view of the agreement with the measurements, the epithermal transmission probability is a constant and can be used over the entire range of spectra examined. Measurements were also made of the dependence of control rod worth on radial position. A comparison of these measurements with statistical weight calculations shows good agreement. A perturbation theory approach which employs the absorption area was then used to evaluate the absolute worth of a single cadmium slab rod in each of the five reactors. Comparison with experimental worths indicates a maximum discrepancy of 8% in $\Delta k/k$. (auth)

9101 MND-Lib-1631
Martin Co., Baltimore.
THERMOELECTRIC POWER SOURCES: AN ANNOTATED LITERATURE SEARCH. PART I. George E. Halpern and Elizabeth G. Sanford. Dec. 5, 1958. 24p.

A literature search for information concerning thermoelectric power sources was conducted. The search covered the literature from 1954 to 1958 except for *Nuclear Science Abstracts* coverage, which was from 1948 to 1958. Sources consulted in addition to NSA were Technical Abstract Bulletin, Engineering Index, and Industrial Arts Index. (J.R.D.)

9102 NARF-59-4T
Convair, Fort Worth, Tex.
FLUX CALCULATIONS BY THE SPHERICAL HARMONICS METHOD. R. L. Kloster. Feb. 20, 1959. 54p. Project 6(1-99064). Contract AF33(600)-32054. (MR-N-219).

The spherical harmonics method of obtaining approximate solutions of the Boltzmann transport equation for neutrons is used to obtain the total flux and angular distribution of neutrons from an isotropic monoenergetic infinite plane source. Plane symmetry is assured by assuming all interfaces to be parallel to the source plane. Problems involving from two to four regions are considered and the general solutions and boundary conditions derived are applied to these problems. Results include the flux and angular distribution of neutrons in an infinite hydrogenous medium, and the effect of a slab of heavy material, placed in this medium at various distances from the source, on the flux and angular distributions. Calculation of the flux, and angular distribution of neutrons from the first four successive odd approximations, P_1, P_3, P_5, and P_7, indicates that for the geometrical arrangements considered a P_3 approximation is sufficient for prediction of the neutron flux. However, the neutron angular distribution shows a highly fluctuant behavior as the degree of the approximation changes, indicating the need for approximations of higher order. Application of the method in an investigation of effective removal cross section calculations is discussed. (auth)

9103 NP-7288
Arizona State Coll., Tempe.
REPORT ON THE MEASUREMENT OF THERMAL DIFFUSIVITY USING A SOLAR FURNACE. Clement J. Kevane. June 1958. 66p. Contract NR-032-419.

In order to develop a method for measurement of thermal diffusivity of materials, the propagation of temperature waves set up by periodic modulation of the heat flux in a solar furnace was studied at moderate temperatures. The experimental results were compared with an analysis of one-dimensional heat flow under periodic excitation to determine thermal diffusivity. Because of small temperature oscillation amplitudes and rather large temperature fluctuations at the focal spot, work was limited to temperatures less than 1000°C. The results are in rough order of magnitude agreement with known thermal diffusivities because of the temperature fluctuation noise and undetermined systematic errors. (auth)

9104 NP-7294
Società Adriatica di Elettricità, Venice.
MISURA DELL'EQUIVALENTE IN ACQUA DEL MANTO NEVOSO MEDIANTE L'ASSORBIMENTO DI UN FASCIO DI RAGGI GAMMA. (Measurement of the Water Equivalence of a Snow Cover by Means of the Absorption of a Gamma Ray Beam.) A. Drigo, F. Forlani, and S. Tagliati. Oct. 1958. 16p.

A method utilizing the absorption of gamma radiation

is given for the measurement of the water equivalence of snow. The apparatus and installation used are described, and the results are discussed. (J.S.R.)

9105 NP-7310

Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

QUARTERLY PROGRESS REPORT NO. 52 [FOR THE PERIOD ENDING NOVEMBER 30, 1958]. J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Jan. 15, 1959. 201p. Project No. 3-99-00-100. Contract DA36-039-sc-64637.

A review of the research activities of the Laboratory is presented for the three-month period ending Nov. 30, 1958. The report of each research group is prefaced with a statement of the objectives of the group. Under the physical electronics group, work is reported on conduction in ZnS single crystals, characteristics of semiconductor junctions, surface states on semiconductors, vacuum-tube-transistorized electrometer millivoltmeter circuits, and transistor-regulated power supplies. Progress in the fields of microwave gaseous discharges and plasma dynamics is described. In microwave spectroscopy the phonon-spin absorption coefficients in paramagnetic crystals, spectroscopy of free atoms, and antiferromagnetic resonance in anhydrous $MnCl_2$ were investigated. Work on nuclear magnetic resonance, hfs of radiothallium, and the g-factor of the $5s5p\ ^3P_1$ level of Cd is described. Detailed information on microwave electronics and statistical communication theory is given. The design and construction of a luminescence camera are described. Progress is indicated in various fields including speech communication, neurophysiology, communications, biophysics, etc. (For preceding period see NP-7107.) (W.D.M.)

9106 NP-7315

Columbia Univ., New York. Columbia Radiation Lab.

RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM. Quarterly Progress Report No. 4 [for] September 16, 1958 through December 15, 1958. 38p. Contract DA-36-039-SC-73279.

A continuation of magnetron studies is reported. It is shown that harmonic generation occurs in low field as well as high field operation. Progress in radio-astronomic measurements with use of maser amplifiers is described. The status of work on a 21 cm maser amplifier which has been successfully operated is outlined and preliminary experiments leading to the development of an infrared maser are described. Several new techniques in microwave measurements are reported. Spectroscopic studies of free radicals, stable molecules, and atomic tritium by the techniques of microwave spectroscopy, molecular beams, and masers are reported. Studies of the properties of gases at high temperatures by the velocity selector method are being continued. (auth)

9107 NYO-2537

New York Univ., New York. Atomic Energy Commission Computing and Applied Mathematics Center.

PROPAGATION OF MAGNETOHYDRODYNAMIC WAVES WITHOUT RADIAL ATTENUATION. Harold Grad. Jan. 15, 1959. 48p. Contract AT(30-1)-1480. $7.80 (ph), $3.30(mf) OTS.

The propagation of hydromagnetic waves is examined in a perfectly conducting compressible fluid. The medium is highly anisotropic and exhibits strange properties, many of which are hidden by Fourier analysis or by examination of plane waves. In a certain sense, it is possible to separate an arbitrary wave motion into three modes (part of the separation is always possible, the remainder only in certain limiting cases). In separating, however, the domain of dependence properties of the original hyperbolic system may be lost. One of the modes (in certain limiting cases, two modes) represents one-dimensional wave propagation along magnetic field lines without three-dimensional radial attenuation. Depending on the amount of dissipation present, such signals could propagate large distances. (auth)

9108 ORNL-2610

Oak Ridge National Lab., Tenn.

PHYSICS DIVISION SEMIANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 20, 1958. Mar. 13, 1959. 64p. Contract W-7405-eng-26. $1.75(OTS).

The theoretical analysis of longitudinal and transverse polarization of conversion electrons in coincidence with beta particles was extended to include mixed multipole conversion following allowed and pure multipole conversion following first-forbidden beta transitions. Extensive numerical results were obtained. The decay rate of the charged pion by virtual pair production of nucleons was calculated by a new method and found to be much less than the experimental value. A new direct interaction of universal form was postulated to account for the decay, and the decay rate of the K meson is thereby given to within 20%. The spherical momentum space formalism was reduced to a simple computational scheme and applied to the experimentally interesting case of electron-electron collisions. Measurements of the Coulomb excitation of the 2^+ states in Se^{76}, Se^{78}, Se^{80}, and Te^{122} have provided information on the gamma-ray decay characteristics from these states. The elastic scattering of neutrons from beryllium was measured at nine energies between 0.7 and 3.0 Mev. Qualitative arguments based on the data lead to the assignment of $J = 2^+$ for the broad resonance level at 3.0 Mev. The cross section for the $Al^{27}(n,\alpha)Na^{24}$ reaction was measured as a function of neutron energy in the range $6.2 \leqq E_n \leqq 8.3$ Mev and at 14.8 Mev. Measurements were made relative to the fission cross section of U^{238}, using activation techniques to determine the $Al^{27}(n,\alpha)$ events. The cross section for the reaction $Li^6(n,\alpha)H^3$ was measured as a function of neutron energy in the range $1.2 \leqq E_n \leqq 8$ Mev. An RCL 256-channel analyzer was added to the time-of-flight equipment. Total cross sections of a number of separated isotopes from A = 45 to A = 76 were measured. Some preliminary work was done on neutron capture cross sections. Total neutron cross sections of Pm^{147}, I^{129}, Zr^{93}, and Np^{237} were measured with the fast-chopper time-of-flight spectrometer. Parameters for the resonances are given. The $H^3(p,n)He^3$ absolute cross-section measurements were re-examined and were found larger than those previously reported by (27 ± 10) % due to protium and He^3 contamination. The $C^{14}(p,n)N^{14}$ reaction cross-section measurements were extended to the first excited state in N^{14} and compared, by reciprocity, with $N^{14}(n,p)$ data. The agreement is reasonable. Preliminary investigations of the low-temperature antiferromagnetic ordering in $CrCl_3$ and $FeCl_3$ are reported. Neutron diffraction experiments on single crystals of $CoCl_2$ in an external magnetic field have established the specific orientation of the magnetic moments in the antiferromagnetic lattice and the manner in which the moments become aligned parallel in

moderate magnetic fields. Preliminary observations indicate a low-temperature antiferromagnetic ordering in the hcp phase of metallic cerium and a change in the electronic configuration when the α-fcc phase is formed. The antiferromagnetic structure was determined for the compound MoF_3, in which the magnetic ion belongs to the 4d group of elements. The nuclear spins of 25-min I^{128} and 12.5-hr I^{130} were determined by atomic-beam magnetic resonance. I^{128} was found to have a spin of 1; I^{130}, however, was found to have a spin of 5, which seems inconsistent with the observed decay of this isotope. Measurements of the microwave spectra of $C^{12}C^{12}H_3F$, $C^{12}C^{13}H_3F$, and $C^{13}C^{12}H_3F$ were made. The first breakthrough was made in assigning atomic energy levels to the rare-earth element erbium, Z = 68. The ground-state level is $4f^{12}(^3H_6) \cdot 6s(^4H_{15/2})$; levels from the configuration $4f^{12}5d$ begin about 0.6 ev above the ground state. Additional Zeeman measurements in the spectrum of plutonium have revealed two additional low-energy levels with possible configuration identification as $5f^6 6d$. Further measurements with the Duo-Plasmatron ion source have indicated detectable and usable yields of H_1^- ions and He^{2+} ions. Further work on the Hutchinson-Scarrott type of pulse spectrometer includes the development of an add-subtract circuit, a selector for splitting the memory into even and odd channels, a gate for automatic dead-time correction, a "count one" test circuit, and a linear analog display. The design of the display and the adjustment procedures required for maintaining a 3% over-all accuracy are described in detail. A fast and flexible code for calculating the properties of equilibrium orbits in AVF cyclotrons was completed for the IBM 704. (For preceding period see ORNL-2501.) (W.D.M.)

9109 ORNL-2652

Oak Ridge National Lab., Tenn.

MATHEMATICS PANEL PROGRESS REPORT FOR PERIOD MARCH 1, 1957 TO AUGUST 31, 1958. A. S. Householder. Mar. 24, 1959. 88p. Contract W-7405-eng-26. $2.25(OTS).

ORACLE operation and programming are summarized, and progress is indicated on various current problems. Work is reviewed on numerical analysis, programming, basic mathematics, biometrics and statistics, ORACLE operations and special codes, and training. Publications and lectures for the report period are listed. (For preceding period see ORNL-2283.) (W.D.M.)

9110 ORO-182

Arkansas. Univ., Fayetteville.

NUCLEAR CHEMISTRY RESEARCH. Annual Progress Report. Dept. of Chemistry. R. W. Fink and Arthur Fry. Jan. 1, 1959. 129p. Contract AT(40-1)-277. $21.30(ph), $6.90(mf) OTS.

Enriched isotopes of Sn^{120}, Sn^{122}, and Sn^{124} in metallic form were irradiated with 14.8 Mev neutrons, and several new short-lived nuclides were observed. In bombardments of natural Si and SiC with 14.8-Mev neutrons a 3 to 4 second half-life has been observed by integral-bias counting of gamma radiation above 1.8 Mev. Radioactive Sc^{50} was separated from Ti foil following irradiation by a fluoride form of an anion exchange resin. The operation and improvement of the 400 kv Cockcroft-Walton accelerator are described. Tracer studies of the mechanisms of ketone rearrangements are reported. Work on the O^{18} exchange studies of benzyl and substituted benzyl alcohols has been concentrated in the aqueous H_2SO_4 systems. (W.L.H.)

9111 RDB(CA)/TN-154

United Kingdom Atomic Energy Authority. Industrial Group. Capenhurst Works, Capenhurst, Ches., England.

A DATA SHEET FOR LITHIUM. J. F. Ellis. 1958. 17p.

Collected data on the physical properties of lithium are presented. Curves plotting variations of specific heat, vapor pressure, liquid density, thermal conductivity, self-diffusion coefficient against temperature, and log (viscosity) against T^{-1} are appended. (auth)

9112 SCDC-813

Texas. Univ., Austin. Structural Mechanics Research Lab.

STRESS-STRAIN CHARACTERISTICS OF MATERIALS AT HIGH STRAIN RATES. PART III. STRAIN RATE EFFECTS AND PLASTIC WAVE PROPAGATION. James W. Turnbow. Jan. 5, 1959. 186p. For Sandia Corp. Contract AT(29-2)-621. $28.80(ph), $8.40(mf) OTS.

The existing theories pertaining to the propagation through rods or wires of stresses exceeding the proportional limit are not in agreement with some aspects of experimental results. In order to resolve these differences, accurate dynamic stress-strain diagrams, obtained under conditions of constant strain rate, are especially required in order to establish the effect of strain rate upon the dynamic stress-strain law. A brief survey is made of the experimental techniques which have been employed in the past for measuring transient loads and strains and for deducing the strain-rate effects. Based on the assumptions made in these previous methods and the results obtained from them, a direct method of recording simultaneously the stress-time and strain-time curves was chosen and impact tests were conducted on short, hollow cylinders of aluminum and copper at strain rates from 40 to 1600 in./in./sec. The method did not permit the establishing of complete stress-strain diagrams, but the ultimate stresses and elastic moduli were obtained and have been presented as functions of strain rate. The results of the experimental investigation show that: (1) The ultimate stress for 6061-T6 aluminum alloy cylinders increases approximately uniformly with increase in strain rate at about 5.4 psi per in./in./sec. (2) The ultimate stress for the copper increases from the static test value of 49,400 psi to 60,000 psi at a strain rate of 200 in./in./sec. From this point, the stress then increases uniformly at about 4.5 psi per in./in./sec. (3) Great care must be taken to insure planeness of impact when the ratio of the length to diameter of the specimen is small; otherwise test results may vary widely. (4) The basic method used does not give the complete stress-strain diagram because of difficulties of interpretation of the test records in the vicinity of the elastic limit stress. (5) A second method, used for the 1600 in./in./sec strain rates, offers more promise for further development. (6) The effective elastic modulus, $\dot{\sigma}/\dot{\epsilon}$, of copper decreases with increase in strain rate. (auth)

9113 SCTM-42-59-(51)

Sandia Corp., Albuquerque, N. Mex.

AIR PRESSURE VERSUS DEPTH OF BURST. B. F. Murphey and E. S. Ames. Feb. 20, 1959. 4p. $1.80 (ph), $1.80(mf) OTS.

Air-blast pressure measurements for scaled depths of burst from 1λ to 3λ are presented to extend information available for use in some Plowshare projects. (J.E.D.)

9114 SCTM-56-59(52)
Sandia Corp., Albuquerque, N. Mex.
ANALYTICAL DETERMINATION OF FLIGHT CHARACTERISTICS OF AIRCRAFT. Alphonse Iacoletti. Mar. 10, 1959. 19p. Contract [AT(29-1)-789].

An analytical method of obtaining various flight characteristics of an aircraft flight maneuver is presented. (auth)

9115 SCTM-438-58-(16)
Sandia Corp., Albuquerque, N. Mex.
PROGRESS IN THE INVESTIGATION OF SHOCK MITIGATION PROPERTIES OF RESILIENT MATERIALS. R. M. Lacey. Feb. 6, 1959. 35p. Contract AT-(29-1)-789. $6.30(ph), $3.00(mf) OTS.

A literature survey, a proposed test program to supplement available information, and a suggested method of cushion design based on certain design considerations and physical constants of fiber glass are presented. Test data of the type required to solve cushioning problems by the proposed method are given. (W.D.M.)

9116 SUI-58-8
Iowa. State Univ., Iowa City.
RADIATION MEASUREMENT FROM EXPLORER IV. [James A.] Van Allen, McIlwain, and Ludwig. Aug. 20, 1958. 2p.

Preliminary results received from Explorer IV during its first two weeks in orbit are presented. The detectors consist of 1 and 1.5 g/cm^2 Geiger counters and two scintillation counters, one connected to a pulse amplifier and discriminator and the other connected to a nonlinear network and electrometer. (W.D.M.)

9117 UCRL-5288-T
California. Univ., Livermore. Radiation Lab.
UCRL ORBIT PROGRAM. PROGRESS REPORT NO. 2: JUNE 1958. Richard Levee and Joseph L. Brady. July 15, 1958. 12p. Contract W-7405-eng-48. $3.30 (ph), $2.40(mf) OTS.

The double-precision Themis code is being used to integrate the motion of Mars and Venus to obtain a complete set of rectangular equatorial coördinates over the interval 1600 to 2000 A.D. Observations of a number of periodic comets extending over this interval are being collected. The Satellite code was extended to include the rotation of the atmosphere. The code was used to investigate the motion of ion rockets. The motion of 1957 Beta was integrated from Dec. 10, 1957, to a death date which was determined as April 1. (For preceding period see UCRL-5240-T.) (W.D.M.)

9118 WADC-TR-55-457
Donaldson Co., Inc., St. Paul.
HIGH VELOCITY AIR FILTERS. Theron E. Wright, Richard J. Stasny, and C. E. Lapple. July 1957. 277p. Task title: STUDY OF AIR FILTRATION. Contract AF33(616)-2745. (AD-142075).

A study was made of the performance of fibrous filters with the specific objective of obtaining design information for high-velocity air filters. Experimental data on pressure drop, collection efficiency, and life for fibrous filters were obtained with two supercooled liquid aerosols (0.3 and 1.4 microns diameter) and one solid aerosol (1.2 micron diameter). Filter fiber size ranged from 3 to 30 microns, filter pad density from 0.01 to 0.10 cu. ft fiber/cu. ft pad, and filter velocity from 0.3 to 100 ft/sec. The data on the collection of liquid aerosols agreed well with theoretical predictions. Collection efficiencies with the solid aerosol particles were very much lower, however, at filtration velocities over 1 ft/sec, apparently due to failure of all colliding particles to adhere to the fibers. The density or degree of compaction of the aerosol deposit was a controlling factor in determining the manner in which aerosol loading of the filter affected pressure drop and collection efficiency. The degree of compaction was, in turn, dependent on both the characteristics of the aerosol particles and on the operating conditions. In the case of the solid aerosol, vibration of the filter produces major effects only at frequencies over 1200 cycles/sec, which was beyond the designed capacity of the vibration equipment. High filter velocities, however, resulted in marked dislodgment and internal redeposition and compaction of previously collected solid aerosol. Data are also presented on pressure drop and collection efficiency for pad-supporting screens, on the mechanical compressibility characteristics of fibers, and on two novel arrangements for particle size analysis. (auth)

9119 WADC-TR-58-80
TRG, Inc., New York.
A MONTE CARLO CODE FOR GAMMA RAY TRANSMISSION THROUGH LAMINATED SLAG SHIELDS. Robert A. Liedtke and Herbert A. Steinberg. Apr. 1958. 140p. Project No. 7-(1-7112). Contract AF33(616)-3616. (AD-203641).

An IBM 704 Monte Carlo code for computing the transmission of monoenergetic and monodirectional gamma rays by a multilayered slab geometry shield is described. The main output data are the total energy current and flux. The associated energy spectra of each accompanied by their standard deviations are also obtained, but at lesser accuracy. Extensive use is made of variance reduction techniques, including use of calculated first collision points, a modified form of the exponential transformation, and statistical estimation of the transmission after each collision. Importance sampling is used for choosing the recoil energy and the change in azimuthal angle following collision. Results are quoted for a Compton scattering medium and for a selected group of one, two, and three slab lead-water shields. Comparisons are made with infinite medium results corrected in a plausible manner for edge effects. They are interpreted as permitting the use of an empirical formula due to M. Kalos for two-slab lead-water shields for a large number of situations of interest. The energy spectra are also discussed. (auth)

9120 AEC-tr-3406
MANY-PARTICLE THEORY. (Theoriya Mnogikh Chastits.) A. A. Vlasov. Translated from a publication of the State Publishing House for Technical-Theoretical Literature, Moscow–Leningrad, 1950. 413p. $4.75(OTS).

The monograph is an exposition of a new theory of many particles. The book generalizes work previously published in the periodical press and is designed for theoretical and experimental physicists. The foundations of the theory are presented in Part I, which includes the first five chapters. The following are discussed: the need for the proposed theory, fundamental equations and their properties, connection of the new theory with classical theories, definition of stationary states of systems of two and many particles, and solutions depending on time. Applications of the theory are presented in Part II, which includes six chapters. The following are discussed: the theory of crystals, vibra-

tion properties of electron plasma, theory of striations, wave properties of media consisting of neutral particles, the theory of electron-ray high-frequency generators, and electron plasma in hydrodynamic approximation. (A.C.)

9121 AEC-tr-3460
COLLECTED WORKS: VOLUME I. CONSTRUCTIVE THEORY OF FUNCTIONS (1905–1930). (Sobranie Sochinenii: Tom I. Konstruktivnaya Teoriya Funktsii (1905–1930).) S. N. Bernshtein. Translation of a publication of the Academy of Sciences of U.S.S.R. Press, 1952, Moscow. 227p. $2.75(OTS)

The constructive theory of functions of a real variable is based on a synthesis of the ideas of Weierstrass and Chebyshev. The field of interest of the constructive theory of functions is in principle almost entirely identical with that of the general theory of functions, except that it does not include transfinite processes. Many of the papers included in the original Volume I were published in French and later translated into Russian. These papers are not included in this translation but are listed for reference purposes. (W.D.M.)

9122 AEC-tr-3552
IONIC CONDUCTION AND DISORDER OF SILVER BROMIDE WITH ADDITIONS OF BIVALENT CATIONS. II. QUANTITATIVE INTERPRETATION OF THE CONDUCTIVITY ISOTHERMS. (Zur Ionenleitung und Fehlordnung von Silberbromid mit Zusätzen Zweiwertiger Kationen. II. Quantitative Deutung der Leitfähigkeitsisothermen.) J. Teltow. Translated for Atomics International from Ann. Physik (6), 5, 71-88 (1949). 39p. (Includes original, 18p.) $6.30(ph), $3.00(mf) JCL or LC.

The concentrations and mobilities of the defects (cations on interstitial positions and cation vacancies) are derived from the measured isotherms of the electric conductivity. The interaction of the defects, which must not be neglected, is discussed on the basis of two simple hypotheses (association and ionic cloud). The observed preponderance of the interstitial ion migration follows from a model consideration of the migration mechanism. (auth)

9123 AEC-tr-3571
LUMINESCENCE SPECTRA OF PLASTIC SCINTILLATORS WITH TRIPHENYLPYRAZOLINE. (Spektry Luminestsentsii Plastmassovykh Stsintilliatorov s Trifenilpirazolinom.) E. A. Andreyeshchev and I. M. Rozman. Translated by Lydia Venters (Argonne National Lab.) from Optika i Spektroskopiya 2, 488-93 (1957). 8p. $1.80(ph), $1.80(mf) JCL or LC.

The luminescence spectra of plastic scintillators of 1,3,5-triphenylpyrazoline–Δ^2 in polystyrene were measured by means of a monochromator and photomultiplier. The luminescence was induced by β particles and Hg lines 2537A and 3650-3663A. The results are discussed from the viewpoint of the problem of energy migration. An analysis of the results indicates that during excitation of plastic scintillators by ionizing radiation, the energy migration on behalf of the absorption of polystyrene luminescence by triphenylpyrazoline plays a minor part. At least 80% of the TPhP luminescence is due to the nonradiative migration of the excitation energy at low TPhP concentrations (10^{-3} g/g). (J.H.M.)

9124 AEC-tr-3575
INTERPRETATION OF THE RESULTS OBTAINED BY S. A. KUSHNERIUK AND C. McKAY. (Report CRT-566). (Interpretation des Resultats Obtenus par S. A. Kushneriuk et C. McKay. (Rapport CRT-566).) A. Amouyal and P. Benoist. Translated by Liz Appleby (Hanford Atomic Products Operation) from report SPM-246 (Addition to CEA-571). 7p. $1.80(ph), $1.80(mf) JCL or LC.

The paper was previously abstracted from the original language and appeared in NSA, Vol. 12, as abstract No. 12735.

9125 AEC-tr-3594
STUDY OF PLASMA WITH THE HELP OF MICRO-RADIOWAVES. (Isseldovanie Plazmy pri Pomoshechi Mikroradiovoli.) M. D. Raizer and I. S. Shpigel. Translated from Uspekhi Fiz. Nauk 64, 641-67(1958). 43p. $7.80(ph), $3.30(mf) JCL or LC.

Microwave methods for the investigation of plasma are presented. It is shown that microwave methods are applicable to studies of certain processes which take place in plasmas. Data on the behavior of charged particles in a plasma obtained by this method are cited. (A.C.)

9126 AEC-tr-3596
IONIC CONDUCTION AND DISORDER OF SILVER BROMIDE WITH ADDITIONS OF BIVALENT CATIONS. I. CONDUCTIVITY MEASUREMENTS AND PHASE DIAGRAMS. J. Teltow. Translated for Atomics International from Ann. Physik (6), 6, 63-88(1949). 19p. (Includes original, 8p.) $3.30(ph), $2.40(mf) JCL or LC.

Part II issued as AEC-tr-3552.

The electric conductivity of solid AgBr with additions of the bromides of Cd, Pb, Ca, and Zn is measured at various temperatures in the homogeneous mixed-crystal region, and the effects of the addition ions are discussed. (auth)

9127 AERE-Lib/Trans-810
ABSOLUTE β COUNTING IN SAMPLES OF SATURATION THICKNESS. J. Heintze and H. Fischbeck. Translated by J. B. Sykes (U.K.A.E.A. Atomic Energy Research Establishment) from Z. Physik. 147, 277-87 (1957). 16p.

A procedure is described whereby the specific activity of a sample of saturation thickness can be calculated from the number of emitted β particles measured in a 2π geometry alone. The calculation involves the effective range of electrons in aluminum averaged over the β spectrum and also a factor a which is insensitive to the β energy E and the atomic number Z of the layer. This factor a and its dependence on E and Z were investigated experimentally over a wide range. The method is applicable to almost any β emitter whose decay scheme and β spectrum are known and gives an accuracy of ~5%. (auth)

9128 CEA-tr-A-293
LES TRANSITIONS SANS ÉMISSION DE RAYONNEMENT DANS LES SULFURES LUMINESCENTS. (Transitions without Radiation Emission in Luminescent Sulfides.) M. Schon. Translated into French from Z. Naturforsch. 6a, 251-5(1951). 15p.

Transitions without radiation were investigated in luminescent sulfides. These transitions are associated with transitions at bonding points to valence bonds. The system of equations was resolved with a very good approximation with the aid of a condition of neutrality. The transitions were studied for both weak and strong excitations. (J.S.R.)

9129 CEA-TR-A-355
THÉORIE DE L'ANALYSE THERMIQUE DIFFERENTIELLE. CONSÉQUENCES PRATIQUES. (THEORY OF DIFFERNTIAL THERMAL ANALYSIS. PRACTICAL RESULTS.) E. Deeg. Translated into French from Ber. deut. keram. ges. 33, No. 10, 321-9(1956). 30p.

From the phenomenological theory of heat conduction, the basic equations valid for general conditions were derived. The equations make possible the exact interpretation of the differential thermal analysis (DTA) diagrams. It is shown that the evolution of the peaks of DTA, which depends in the general case on 16 parameters, does not permit clear conclusions on the heats of reaction. The possible origin of such peaks when they are conditioned by a modification of the substance of the sample is discussed. A condition for which, in spite of the presence of a finite heat development in the substance studied, a "typical" effect in the DTA diagrams is not produced is indicated. Precise conclusions on the reaction heats can be drawn from the DTA diagrams only in the case where the thermal characteristics of the sample do not vary during the reaction and the test parameters are identical in the inert substance and in the sample. This case can be realized for substances ceramically interesting by an appropriate fabrication of the sample. The basic equations developed permit the elimination of the influence of thermal characteristics and of parameters determined by the test conditions. For a simple test set-up, the general theory is used for the calculation. The fashion in which the heat development, the variations of the thermal constants, and the displacement of the thermocouple is reflected on the DTA diagram is shown. A formula is given which permits the direct determination of the reactant content of a sample, beginning with the material constants and magnitudes determined experimentally. (tr-auth)

9130 CEA-tr-A-450
LA VIOLATION DES SYMÉTRIES PAR RAPPORT À UN PLAN DANS LES LOIS DE LA PHYSIQUE ATOMIQUE. (Symmetry Violation with Respect to a Plane in the Laws of Atomic Physics.) W. Pauli. Translated into French from Experientia 14, 1-5(1958). 12p.

The categorization of nuclear interactions are reviewed, and the symmetries C, P, and T are defined. A qualitative survey is then made of the experimental proofs of the violation of left-right symmetry and charge symmetry. The theoretical problems of symmetry violation are briefly discussed. (J.S.R.)

9131 CEA-tr-A-493
ETUDES SUR LA STRUCTURE DE SUBSTANCES POREUSES. (Studies on the Structure of Porous Substances.) A. Dietzel and H. Saalfeld. Translated into French from Ber. deut. keram. ges. 34, 363-6 (1957). 16p.

Two methods, based on the measurements of the conductivity of cubic samples impregnated with electrolyte, are described for the determination of the anisotropy of porous materials. The methods described permit the experimental measurement of the influence of direction in the porous material. The results are usable characteristics for the definition of a porous structure. Two opposed directions of a porous samples are not always equivalent, which is probably caused by the geometry of the capillary system. (J.S.R.)

9132 CEA-tr-A-499
LE BÉTON DANS LA TECHNIQUE DE LA PROTECTION CONTRE LE RAYONNEMENT. (Concrete in the Technology for Protection Against Radiation.) Thomas Jaeger. Translated into French from Atomkernenergie 2, 217-22(1957). 27p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 12942.

9133 CEA-tr-R-346
THEORIE DE LA JAUGE À IONISATION. (Theory of the Ionization Gage.) L. P. Khavkin (Khavkine). Translated into French from Zhur. Tekh. Fiz. 26, 2356-60(1956). 13p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 12531.

9134 CEA-tr-R-504
MESURE DES CHAMPS MAGNÉTIQUES PAR LA METHODE DE RESONANCE MAGNETIQUE DES PROTONS. (Measurement of the Magnetic Fields by the Method of Proton Magnetic Resonance.) A. I. Zhernovoi (Jernovoi), G. D. Latyshev (Latychef), and A. G. Sergeev (Sergueief). Translated into French by I. Melnick from Pribory i Tekh. Ekspt., No. 2, 60-2(1957). 12p.

An apparatus is described which permits a measurement of the intensity of a magnetic field in all the ranges necessary to spectroscopy. The precision of the measurements relative to the magnetic field, determined by resonance according to the length of the absorption curve, is 10^{-4} in the zone from 35 to 100 oersteds and 2×10^{-5} in the zone from 100 to 400 oersteds. The verification of the precision of the measurements was made by reproduction of the positions of the maxima of the conversion rays. (tr-auth)

9135 CEA-tr-R-563
IV. INTERPRETATION THEORIQUE DE LA SENSIBILITE PHOTOGRAPHIQUE A L'ACTION DES ELECTRONS DE DIFFERENTES ENERGIES EN FONCTION DE LA DIMENSIONS DES GRAINS ET DU DEGRE DE MATURATION DE L'EMULSION. (IV. Theoretical Interpretation of the Photographic Sensitivity to the Action of Electrons of Different Energies as a Function of the Grain Dimensions and of the Degree of Aging of the Emulsion.) K. S. Bogomolov. Translated into French by B. Vinogradoff from Zhur. Nauch. i Priklad. Fot. i Kinematografii 1, 401-12(1956). 20p.

A quantitative theory is proposed for the photographic action of weakly ionizing particles. The theory was established by taking into account the fluctuations of primary ionization actions in the microcrystals of the emulsion. The theory is applicable in practice to emulsions with relatively high sensitivities, in which the microcrystals react to 1, 2, 3, or a few more actions of primary ionization, but only for a single impact of the primary particle. The theory satisfies the experimental sensiometric data for emulsions formed of grains of variable dimensions and with a variable degree of aging. (tr-auth)

9136 IGRL-T/CA-101
ON THE THEORY OF SEPARATION OF THE CONSTITUENTS OF A MIXTURE OF GASEOUS ISOTOPES BY DIFFUSION THROUGH A POROUS MEMBRANE. D. Massignon. Translated by C. Boorman (U.K.A.E.A., Capenhurst) from Chap. 42 of Proc. Intern. Symposium on Isotopes Separation, Amsterdam, 1957. 14p.

In the theory of Present and de Bethune for separation of gas mixtures flowing through a porous membrane,

the pores are long cylindrical capillaries of circular cross-section, and the reflection of the gas molecules against the walls is supposed to follow Knudsen's law. Using for the binary mixtures some methods already known for simple gases, similar separation theories are derived for a porous membrane whose pores may be short, tortuous, and of various cross sections and where the reflection of the molecules may deviate from the usual cosine law. (auth)

9137 NP-tr-215
BREAKDOWN IN VACUUM. V. N. Glazanov. Translated for U.K.A.E.A. Atomic Energy Research Establishment from Elektrichestvo, No. 3, 40-4(1958). 11p. $4.80(ph), $2.70(mf) JCL or LC.

The solution of the problem of physical breakdown in vacuum in connection with the construction of accelerators is investigated. The work gives an analysis of present theories and the most probable explanation of breakdown in vacuum. (A.C.)

9138 NP-tr-217
COEFFICIENTS OF INTERNAL CONVERSION OF GAMMA RADIATION. PART 2. L-SHELL. L. A. Sliv and I. M. Band. Translated by Peter Axel (Univ. of Illinois) from a publication of the Academy of Sciences, U.S.S.R., 1958 (Moscow—Leningrad). 61p.

Part 1 issued as AEC-tr-2888. Issued by Univ. of Illinois as Report 58 ICC L1.

The values for L_I, L_{II}, and L_{III} subshells form the second part of tables of internal conversion coefficients. The first part of the tables, which dealt with the K-shell, was issued earlier. All physical assumptions used in the calculations are the same as those used for the K-shell. Notable among these are: (1) the effect of the finite size of the nucleus taken with a uniform volume charge distribution and with a surface distribution of transition currents; and (2) the effect of screening following the method of Thomas-Fermi-Dirac. The tables were prepared for the elements between Z = 41 and Z = 98, and for the gamma-ray energy range from $k = 0.05\ mc^2$ to $k = 2\ mc^2$. The values of the coefficients in the energy range from $0.05\ mc^2$ to $1\ mc^2$ are calculated to an accuracy of ± 2%; for the energy range from $1.5\ mc^2$ to $2\ mc^2$, especially in the region from Z = 41 to Z = 57, the values are less precise. (auth)

9139 NP-tr-222
COMPUTATION OF ELECTRON TRAJECTORIES IN CROSSED ELECTRIC AND MAGNETIC FIELDS. V. V. Degtiarev. Translated for MIT, Lincoln Lab. from Izvest. Vysshikh Uchehnykh Zavednii, Ser. Fiz. No. 5, 102-7(1958). 8p.

The problem is considered of computing trajectories of electrons moving between plane-parallel electrodes under the effect of direct electric and magnetic fields and the variable electrical field of a progressing wave. The electrical field intensity has x and y components and the magnetic field just a z component. Relativistic effects and electron interaction are not taken into a account. (auth)

9140 SCL-T-217
NEW FERROELECTRICS AND ANTIFERROELECTRICS. (Novye Segnetoelektriki i Antisegnetoelektriki.) G. A. Smolenskii. Translated by Marcel I. Weinreich (Sandia Corp.) from Uspekhi Fiz. Nauk 62, 41-69(1957). 42p. $12.30(ph), $4.50(mf) JCL or LC.

The main distinctive peculiarity of ferroelectrics is the presence of a phase transition of the first or second order from a disordered state into a well-ordered polarized state. As the result of the emergence of spontaneous polarization, the ferroelectrics possess more or less pronounced anomalies in electrical and other properties. The temperatures of the phase transitions pertaining to the new ferroelectrics and antiferroelectrics having a hydrogen bond are tabulated. A number of new ferroelectrics were discovered, and certain antiferroelectrics were detected and investigated. (A.C.)

9141 SCL-T-225
PROPERTIES OF ZENER-DIODES AND THEIR APPLICATION AS VOLTAGE STANDARD. (Eigenschaften von Zener-Dioden und ihre Anwendung als Spannungsnormal.) G. Meyer-Brötz. Translated by Marcel I. Weinreich (Sandia Corp.) from Elektron. Rundschau 11, 376-7(1957). 8p. $1.80(ph), $1.80(mf) JCL or LC.

If a blocking voltage of a few hundred mv is applied to a silicon diode, a very small biasing current of a fraction of a μa will flow. In case of an increase of the voltage which is polarized in the backward direction, a sudden and strong rise of the current above 4 v is observed. Over a large area of the bias currents a nearly constant voltage is obtained that can be selected depending upon the manufacturing process, which can be used as a standard or reference potential. Various applications are examined. (W.D.M.)

9142 SCL-T-228
MODEL TESTS ON BALL LIGHTNING. (Modellversuche zum Kugelblitz.) H. Nauer. Translated by Marcel I. Weinreich (Sandia Corp.) from Z. Angew. Phys. 5, 441-50(1953). 30p. $4.80(ph), $2.70(mf) JCL or LC.

Ball lightning phenomena and properties gleaned from a collection of observations are examined. The observations of a diffusion combustion of minute gas admixtures in air are thoroughly examined because they display the greatest resemblance to natural ball lightning. A comparison of properties with the qualities of the luminous clouds during diffusion combustion shows very good agreement. (W.D.M.)

9143 SCL-T-229
THE ZONAL WIND COMPONENT IN THE ATLANTIC-EUROPEAN SECTOR AS A FUNCTION OF BRIEF FLUCTUATIONS OF THE SOLAR ACTIVITY. II. EXPANDED STUDY. (Die Zonale Windkomponente im Atlantisch-Europäischen Sektor in Abhängigkeit von Kurzperiodischen Schwankungen der Sonnenaktivität. II. Erweiterte Untersuchung.) H. Trenkle. Translated by Marcel I. Weinreich (Sandia Corp.) from Meteorol. Rundschau 10, No. 6, 177-9(1957). 13p. (Includes original, 3p.) $3.30(ph, $1.40(mf) JCL or LC.

In a previous study the relationships between brief fluctuations of the solar activity and corresponding fluctuations of the zonal component of the geostrophic wind (Ug_{120}) between 50° and 60°N in the Atlantic-European sector (60°W—60°E) in the 500 mb area were proved statistically. Considering the circulation form on the check-spot day, it was shown that solar impacts in a low index bring about excessive increases of Ug_{120} up to the 7th consecutive day, and that, in a high index, they effect a corresponding decrease of Ug_{120} up to the 21st consecutive day. In the present study, the above findings are verified and confirmed on the basis of a more comprehensive observation material and under improved conditions. (auth)

9144 SCL-T-230

SOME PROPERTIES OF DIAMONDS AS A CRYSTAL COUNTER. (Quelques Proprietes du Diamant comme Compteur a Cristal.) H. Ess and J. Rossel. Translated by Marcel I. Weinreich (Sandia Corp.) from Helv. Phys. Acta 23, 484-7(1950). 8p. (Includes original, 4p.) $1.80(ph), $1.80(mf) JCL or LC.

Measurements were carried out within a framework of general inquiries into the mobility of electrons in crystals at different temperatures, under conditions eliminating the effects of polarization and of space charges. The results presented refer to a diamond specimen selected from 8 crystals. The initial charge was produced either by irradiation with alpha particles from a Po source which was located at a variable distance from the crystal or by the gamma rays coming from Ra. (W.D.M.)

9145

GAMMA RAYS OF LOW ENERGY IN THE COSMIC RADIATION AT SEA LEVEL. N. D'Angelo (Istituto Superiore di Sanita', Rome). Am. J. Phys. 27, 147-50(1959) Mar.

A study of the cosmic gamma rays of low energy at sea level by means of a NaI crystal spectrometer is described. No gamma-ray lines of direct atmospheric origin are found in the energy region investigated. (auth)

9146

DEPOSITION BY THERMAL EVAPORATION OF THIN FILMS OF TITANIUM AND ZIRCONIUM FOR TRITIUM TARGETS. V. D. Scott and L. W. Owen (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Brit. J. Appl. Phys. 10, 91-3(1959) Feb.

Equipment and procedure are described for applying thin films of titanium and zirconium as tritium carriers to backings of copper, gold, and platinum. A large proportion of the coatings prepared absorbed high atom ratios of tritium, titanium being more satisfactory in this respect than zirconium. It is suggested that defects in the coating arise mainly from the undesirable reaction of the metals with residual gases, particularly oxygen, during evaporation in the vacuum chamber. Firstly, this causes stress, brittleness, and owing to lack of adhesion, blistering of the deposit; secondly absorption of tritium is inhibited by the oxide film on the metal surface, and the total amount absorbed reduced as a result of there being fewer lattice sites available for the tritium. An electron diffraction examination showed that although the deposits appeared bright and metallic, a thin protective oxide film was present on the evaporated titanium and zirconium. (auth)

9147

FLUID DYNAMICS. A. K. Oppenheim and R. A. Stern (Univ. of California, Berkeley) and C. V. Sternling and C. A. Sleicher, Jr. (Shell Development Co., Emeryville, Calif.). Ind. Eng. Chem. 51, 437-52(1959) Mar.

Fluid dynamics is reviewed. The material is classified into sections on: equations of motion and stability, turbulence, vortex flow and rotation, jets and wakes, flow near solid surfaces, multiphase and free-boundary flow, gas dynamics, wave dynamics, dynamics of reactive fluids, and dynamics of conducting fluids. 329 references. (T.R.H.)

9148

ABSOLUTE MEASUREMENT OF β-EMITTERS OF LOW ENERGY AND LOW SPECIFIC ACTIVITY, Y. Le Gallic and M. Thenard (Commissariat à l'Energie Atomique, Saclay, France). Intern. J. Appl. Radiation and Isotopes 4, 249-52(1959) Jan.

A description is presented of a method of measurement particularly suited to determining the activity of low-energy β emitters of low specific activity, such as sulfur-35, carbon-14, and calcium-45. The technique described employs the solutions themselves without the need of preparing solid sources. The solution is placed in a thin-walled container between two window counters, or in a bowl with a thick flat bottom, in which case only one counter is used. In the former case, the threshold of detection corresponds to $5 \cdot 10^{-4}$ $\mu c/cm^3$ and the threshold of measurement corresponds to 10^{-3} $\mu c/cm^3$. The accuracy of the method varies from 4 to 6 per cent for activities between 1 $\mu c/cm^3$ and $5 \cdot 10^{-3}$ $\mu c/cm^3$. (auth)

9149

A NEW CLASS OF DIGITAL DIVISION METHODS. James E. Robertson (Univ. of Illinois, Urbana). IRE Trans. on Electronic Computers EC-7, 218-22(1958) Sept.

This paper describes a class of division methods best suited for use in digital computers with facilities for floating point arithmetic. The division methods may be contrasted with conventional division procedures by considering the nature of each quotient digit as generated during the division process. In restoring division, each quotient digit has one of the values $0, 1, \cdots, r-1$, for an arbitrary integer radix r. In nonrestoring division, each quotient digit has one of the values $-(r-1), \cdots, -1, +1, \cdots, +(r-1)$. For the division methods described here, each quotient digit has one of the values $-n, -(n-1), \cdots, -1, 0, 1, \cdots, n-1, n$, where n is an integer such that $\frac{1}{2}(r-1) \leq n \leq r-1$. A method for serial conversion of the quotient digits to conventional (restoring) form is given. Examples of new division procedures for radix 4 and radix 10 are given. (auth)

9150

LUMINESCENCE OF EUROPIUM, SAMARIUM, AND TERBIUM ORGANIC COMPLEXES. V. V. Kuznetsova and A. N. Sevchenko. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 23, 2-8(1959). (In Russian)

The luminescence characteristics of europium, samarium, and terbium complexes with salicylaldehyde derivatives were investigated. (R.V.J.)

9151

PARAMAGNETIC RESONANCE STUDY OF IRRADIATED GLASSES OF METHANOL AND ETHANOL. Henry Zeldes and Ralph Livingston (Oak Ridge National Lab., Tenn.). J. Chem. Phys. 30, 40-4(1959) Jan.

Methanol and ethanol, including some of those alcohols with deuterium substitution, have been cooled to glasses at 77°K, irradiated with gamma rays, and then examined at several temperatures in a paramagnetic resonance spectrometer. The alcohols become intensely colored, and a paramagnetic resonance spectrum associated with this color has been observed superimposed on part of an underlying spectrum. The color can be bleached with incandescent illumination, and after bleaching the underlying three- or five-line spectrum (methanol and ethanol, respectively) becomes stronger showing that the bleachable species is a precursor for at least a portion of the species giving the underlying spectrum. The manner in which the five-line ethanol spectrum changes with temperature is discussed. Deuterium

substitution shows that the hyperfine lines originate from four of the protons originally present on the carbon atoms of the parent alcohol and that a proton of the parent alcohol has left the α-carbon. Possible radicals that could explain the results are discussed. (auth)

9152

INFRARED SPECTRA OF H_2O, D_2O, AND HDO IN SOLID ARGON, KRYPTON, AND XENON. Edward Catalano (Univ. of California, Berkeley and Livermore) and Dolphus E. Milligan (Univ. of California, Berkeley and Mellon Inst., Pittsburgh). J. Chem. Phys. 30, 45-7 (1959) Jan.

Infrared spectra of H_2O and D_2O suspended in solid argon, xenon, and krypton have been obtained in the temperature range 20 to 4.2°K. A systematic study of the spectra of these species as a function of concentration and temperature has been carried out. Doublets with components centered within a few wave numbers of the gas phase OH and OD stretching frequencies are observed at dilutions in the range 500 to 1300 for the quantity M/R (M/R denotes molar ratio of rare gas to H_2O or D_2O). Spectra of these species in the bending region are considerably more complex. Between six and eight bands with frequency separations on the order of 10 to 20 cm^{-1} are observed in this region. These features appear to be independent of M/R in the range 500 to 1300. At least one and possibly two of the lower frequency components in the spectrum of H_2O in argon decrease in intensity on lowering the temperature of the sample. These results have been interpreted on the basis that H_2O and D_2O rotate in solid Ar, Xe, and Kr. (auth)

9153

MASS SPECTROMETRIC STUDY OF HEATS OF SUBLIMATION OF DYSPROSIUM, SAMARIUM, THULIUM, AND YTTERBIUM. William R. Savage, Donald E. Hudson, and Frank H. Spedding (Iowa State Coll., Ames). J. Chem. Phys. 30, 221-7(1959) Jan.

The flux of atoms from a Knudsen-type effusion cell has been studied by means of a mass spectrometer. The heat of sublimation was obtained from the dependence of the ion current upon the cell temperature by means of the Clausius-Clapeyron equation. The method was used to obtain heat of sublimation values for dysprosium, samarium, thulium, and ytterbium. The results were: Dy, 69.3 ± 0.6 kcal/mole for vaporization at 1215°K; Sm, 48.7 ± 0.4 kcal/mole for vaporization at 811°K; Tm, 56.2 ± 0.4 kcal/mole for vaporization at 937°K; and Yb, 39.5 ± 0.5 kcal/mole for vaporization at 667°K. (auth)

9154

MAGNETIC SUSCEPTIBILITIES OF URANIUM (IV) AND PLUTONIUM (IV) IONS IN CUBIC FIELDS. George A. Candela, Clyde A. Hutchison, Jr., and W. Burton Lewis (Univ. of Chicago and Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 30, 246-50(1959) Jan.

The magnetic susceptibilities of (a) $[(CH_3)_4N]_2PuCl_6$, (b) $[(CH_3)_4N]_2UCl_6$, (c) Cs_2UCL_6, of solid solutions of (d) PuO_2 in ThO_2, and of (e) $[(CH_3)_4N]_2PuCl_6$ in $[(CH_3)_4N]_2PtCl_6$ have been measured at room temperature, the boiling point of liquid N_2, and the boiling point of liquid He. The measurements of others on (f) solid solution of UO_2 in ThO_2 are also considered. It has been found that (a), (e), and (f) show strongly temperature-dependent susceptibilities whereas (b), (c), and (d) have susceptibilities that vary only slightly with temperature over the range investigated. The results are discussed in terms of ground state configurations f^2 and f^4 perturbed by the crystal fields. (auth)

9155

UNUSUAL TEMPERATURE DEPENDENCE OF FLUORESCENCE OF URANYL IONS EMBEDDED IN ICE. Sohachiro Hayakawa and Masao Hirata (Univ. of Tokyo). J. Chem. Phys. 30, 330(1959) Jan.

The fluorescence of uranyl nitrate, $UO_2(NO_3)_2 \cdot 6H_2O$, dissolved in ice at low temperatures was measured. Some unusual temperature dependences of the intensities and spectra were observed. (J.E.D.)

9156

INFRARED SPECTRUM OF BF_3. Jack Vanderryn (Oak Ridge National Lab., Tenn.). J. Chem. Phys. 30, 331-2 (1959) Jan.

The infrared spectrum of BF_3 was reinvestigated to clarify the assignment. Bands assigned as ν_3, $\nu_1 + 2\nu_4$, $\nu_3 + \nu_4$, $2\nu_1 + \nu_4$, $\nu_1 + \nu_3$, $2\nu_3$, and $2\nu_1 + \nu_3$ were observed and compared to literature and calculated values. (J.E.D.)

9157

EFFECTS OF GADOLINIUM UPON THE H_2O^{17} NUCLEAR RESONANCE. R. G. Shulman and B. J. Wyluda (Bell Telephone Labs., Murray Hill, N. J.). J. Chem. Phys. 30, 335-6(1959) Jan.

Measurements of the relative shifts to higher fields of the H_2O^{17} resonance in an aqueous solution of paramagnetic gadolinium ions are reported. (auth)

9158

SCINTILLATION IN HELIUM AT HIGH PRESSURES DUE TO ALPHA PARTICLES. S. A. Baldin, V. V. Gabrilovski, and F. E. Chukreev. J. Nuclear Energy 8, 247-52(1959) Jan.

A systematic study was made of the brightness of light flashes induced in helium and mixtures of helium with other gases by α particles emitted from polonium. The dependence of the light output on pressure and on the concentration of different impurities in the helium was determined. (A.C.)

9159

NUCLEAR SHELL STRUCTURE AND EXCITATION FUNCTIONS. Maurice E. Nahmias (College de France, Paris). J. phys. radium 19, 961-2(1958) Dec. (In French)

The hypotheses to explain the apparent "inversion" in reactions of the type $Ni^{60}(\alpha,2n)$ and $Ni^{60}(\alpha,pn)$, where the cross section for the second reaction is higher than that for the first reaction, are discussed with respect to the excitation function of the compound nucleus. (J.S.R.)

9160

THE STABILITY OF ION BEAMS FOR ELECTROMAGNETIC SEPARATORS OF ISOTOPES. C. Cassignol, P. Lazeyras, and G. Ranc (C. E. N., Saclay, France). J. phys. radium 19, Suppl., 147A-9A(1958) Dec. (In French)

Intensity and resolution losses in the operation of the isotope separators when the pressure is very low are explained by the presence of a random residue of space charge due to the fluctuations of intensity of ionic beams. Consequently, a doubt arises about the increase of the energy spread when the ion source works in an unsteady state. (auth)

9161

SEMI-STIGMATIC ELECTROSTATIC ANALYZER FOR THE SEPARATION OF ISOTOPES. C. Cassignol,

G. Ranc, and R. Salvaudon (C. E. N., Saclay, France). J. phys. radium 19, Suppl., 150A-3A(1958) Dec. (In French)

The good results obtained by addition of an electrostatic stage to the electromagnetic separator of Saclay permitted the continuation of the work and the correction of residual weaknesses. The major improvement lies in the electrostatic field pattern. A double convergence was achieved, called half stigmatism. The images are of smaller area and the transmission factor of the apparatus is greater than for the cylindrical field structure. Nevertheless, the isotopic purity of the products collected remains the same. (auth)

9162

RADIATION AROUND THE EARTH TO A RADIAL DISTANCE OF 107,400 KM. James A. Van Allen and Louis A. Frank (State Univ. of Iowa, Iowa City). Nature 183, 430-4(1959) Feb. 14.

Radiation detectors and the radio-telemetry system for Pioneer III observations of the Earth's radiation belt are described. Information is given on the vehicle and its trajectory, and logs of flight and telemetry. Observation data and analysis of the data are presented under the following topics: intensity-structure of the region of trapped radiation; effective radial extent of the geomagnetic field; interplanetary value of cosmic-ray intensity; fluctuations in counting rate beyond 10 earth radii; and biological exposure levels. (J.H.M.)

9163

COSMIC RADIATION AND THE WEATHER. Edward P. Ney (Univ. of Minnesota, Minneapolis). Nature 183, 451-2(1959) Feb. 14.

Information is presented on the existence of a large tropospheric and stratospheric effect produced by the solar-cycle modulation of cosmic rays. Consideration is given to climatological effects of solar-cycle period. (J.H.M.)

9164

METALLIC CONDUCTION IN THE CRYSTAL COMPOUNDS OF GRAPHITE. A. R. Ubbelohde, L. C. F. Blackman, and J. F. Mathews (Imperial Coll. of Science and Tech., London). Nature 183, 454-6(1959) Feb. 14.

Tests were made on samples of graphite in which the preferred orientation of the carbon hexagon networks was so good that the results permit definite inferences about the behavior of single crystals, and in particular about the anisotropy of the electronic properties along the a and c axes of graphite. Also, tests were made on samples of graphite in which individual crystallites show excellent alignment of their a-axes parallel to a plane, and of the c-axis normal to it. It was found that because of the excellent alignment, these specimens could take up materials such as bromine, iodine monochloride, or potassium up to the limiting values characteristic of the most highly charged crystal compounds, with cracking due to uneven expansion of individual regions in the specimen. Data are presented on the relative change of resistance in a and c axis directions on forming crystal compounds of graphite. Comparisons were made of the resistivity of well-aligned graphite and its crystal compounds with that of iron, nickel, and aluminum. (J.H.M.)

9165

PROPULSION BY IONS AND IONIZED PLASMAS. A. von Engel (Univ. of Oklahoma, Norman). Nature 183, 573-4(1959) Feb. 28.

The feasibility of using ions and ionized plasmas for the propulsion of rockets and space vehicles is discussed. Different techniques in obtaining thrust from these suggested fuels are reviewed. (J.H.M.)

9166

HYPERFRAGMENT DECAY ENERGY AND ANGULAR DISTRIBUTION. I. J. Szymanski (Warsaw Univ.). Nuovo cimento (10) 10, 834-43(1958) Dec. 1.

Impulse approximation is applied to hyperfragment decay. The π-meson energy distribution is obtained for the ${}_{\Lambda}He^{5}$ case neglecting π-α interaction. Results are compared with experiment, and the validity of impulse approximation is discussed. (auth)

9167

PENETRATION OF A MAGNETIC FIELD INTO A ONE DIMENSIONAL PLASMA. A. Ron (Israel Inst. of Tech., Haifa). Nuovo cimento (10) 10, 844-53(1958) Dec. 1.

In connection with the proposed compression and heating of a plasma through the application of an external magnetic field, the problem of the penetration of such a field into a plasma arises. How an external magnetic field penetrates into a one dimensional bounded plasma which behaves as a compressible hydromagnetic fluid whose conductivity is proportional to density is investigated. The resulting mathematical problem is complicated, in particular as the movement of the boundary is not known beforehand. Transformation to a system of co-ordinates moving with the fluid simplifies the equations. In particular, in the case of a slowly varying magnetic field a single equation is obtained with the magnetic field as the only independent variable. (auth)

9168

THE MEASUREMENT OF EXPOSURE DOSE FOR HIGH ENERGY RADIATION WITH CAVITY IONIZATION CHAMBERS. T. E. Burlin (Hammersmith Hospital, London). Phys. in Med. Biol. 3, 197-206(1959) Jan.

The conventions adopted for measuring the exposure dose of high-energy radiation with cavity ionization chambers are reviewed, and related problems are discussed. Theoretical and experimental evidence is presented to suggest that the exposure dose is measured at the geometric center of the air volume and that corrections are necessary for absorption of the radiation in the entire thickness of the equilibrium wall and for nonuniformity of the radiation across the chamber. (auth)

9169

THE ENERGY RESPONSE OF A VICTOREEN CONDENSER IONIZATION CHAMBER. A. J. D. Szilvasi and G. N. Whyte (National Research Council, Ottawa). Phys. in Med. Biol. 3, 207-11(1959) Jan.

The energy response of a 25-r Victoreen chamber has been measured over the range of photon energies from 40 kev to 1.25 Mev. The difference in response frequently observed between the conventional x-ray region and the gamma-ray region is confirmed. Theoretical response curves for chambers composed of combinations of graphite and heavier elements are compared with the Victoreen curve. (auth)

9170

A STUDY OF THE EXTERNAL GAMMA-RAY FIELD ARISING FROM A RADIOACTIVE SOURCE SITUATED IN AIR AND IN A SCATTERING MEDIUM. H. A. B. Simons and S. Chomet (Royal Free Hospital School of Medicine, London). Phys. in Med. Biol. 3, 233-54(1959) Jan.

A theoretical and experimental study has been made

of the response of a scintillation counter with a cylindrical collimating hole to a point source of radioactivity which may move throughout the region seen by the collimator. The theory has been approximated and extended to give a simple solution of the response of the counter to a line source, lamina or parallel-sided slab of radioactive fluid of uniform activity and some experimental results are given. The effect of scattering in a semi-infinite medium in which the source is situated if measurements are made outside the medium has been determined. This has been found to have a negligible effect upon the localization of a point source even with the largest collimation angle used, where the ratio of the length to the diameter of the collimating hole was 3 to 1. (auth)

9171

A WIDE RANGE DIRECT READING X-RAY DOSIMETER. S. Stuart (Electronic Instruments, Ltd., Richmond, Surrey, Eng.) and S. B. Osborn (University Coll. Hospital, London). Phys. in Med. Biol. 3, 255-63(1959) Jan.

A portable, direct-reading electrometer is described which, coupled to a 40 cm^3 ionization chamber, has been used for measuring x-ray diagnostic gonad doses and dose rates down to 0.45 mr and 0.045 mr/sec full scale. The circuit is essentially a direct-coupled battery operated amplifier with negative feedback, and provided with pre-set compensation for component variations and chamber volume. The performance is analyzed in some detail and compared with similar circuits. (auth)

9172

PROPAGATION OF DISTURBANCES AT HIGH FREQUENCIES IN GASES, LIQUIDS, AND PLASMAS. H. S. Green (Dublin Inst. for Advanced Studies). Phys. of Fluids 2, 31-9(1959) Jan.-Feb.

A method is developed for investigating the propagation of disturbances at small amplitude in fluids from the molecular or ionic standpoint. Adopting as variables the displacements of the particles from a configuration of thermal equilibrium, the equations of motion are derived, in statistical form, for both classical and quantum mechanics. It is shown how to apply this theory in the high-frequency region by neglecting the correlation between the displacements of neighboring particles. Relaxation frequencies are defined, and it is shown that anomalous absorption and dispersion will be found in their neighborhood. Beyond the relaxation frequency, the medium will show elastic or dispersive properties, according to whether the thermal velocities are below or exceed the velocity of propagation. A completely ionized system will have no relaxation frequencies. (auth)

9173

MAGNETOHYDRODYNAMIC FLOW IN A SHOCK TUBE. M. Mitchner (Lockheed Aircraft Corp., Palo Alto, Calif.). Phys. of Fluids 2, 62-71(1959) Jan.-Feb.

The effect of a transverse magnetic field on the motion of a perfectly conducting fluid in a shock tube is examined. A generalized form of the Riemann invariant for the continuous motion of such a fluid is combined with the conservation equations for a magnetohydrodynamic shock to obtain an exact description of the fluid motion in a shock tube in terms of arbitrary initial conditions. The fluids are assumed to have constant specific heat ratios. Qualitatively, the effect of the magnetic field is equivalent to that of a pressure, but quantitatively the effect is always greater than merely the hydrodynamic pressure equivalent of the appropriate Maxwell stress. A magnetic field in the high-pressure region alone can produce shocks having Mach numbers for typical laboratory conditions, of the order of hundreds, and in general is in agreement with available experimental results. A magnetic field in the low-pressure region results in weaker, but higher velocity shocks. (auth)

9174

SOME COMPRESSION WAVES IN PLASMAS. Daryl Reagan (Oxford Univ.). Phys. of Fluids 2, 93(1959) Jan.-Feb.

Experiments are described on the excitation of compression waves in plasmas by transient phenomena such as shocks and arcs or by hydromagnetic instabilities. The possibility of powering them from an external source is suggested. (A.C.)

9175

PHOTODETACHMENT CROSS SECTION OF THE NEGATIVE HYDROGEN ION. Stephen J. Smith and David S. Burch (National Bureau of Standards, Washington). Phys. Rev. Letters 2, 165-6(1959) Feb. 15.

The results of the first precise measurement of the wavelength dependence of the photodetachment cross section of the negative atomic hydrogen ion in the range from 0.4 to 1.3 μ are reported. The measurement was accomplished by improving signal-to-noise ratio in the experiment through improvement of preamplifier detection sensitivity and elimination of background signals and by developing a direct, reliable method for relative determination of light intensity in the photon beam. (W.D.M.)

9176

ON THE PROPERTIES OF HELIUM FILMS AND SUPERLEAKS. C. G. Kuper (St. Salvator's Coll., St. Andrews, Scot.). Physica 24, 1009-17(1958) Dec.

The properties of liquid helium in very narrow channels and in the Rollin film are investigated theoretically, using as a model Landau's ideal gas of elementary excitations. Besides roton and phonon excitations, surface waves and quantized vortex lines must be considered; moreover, the energy of a roton is reduced by the proximity of a solid wall. The order of magnitude of the critical velocity and the dependence of the critical velocity on film thickness can be explained in terms of the surface excitations, but in "superleaks" (e.g., Vycor glass) this mechanism is inoperative. Apart from a contribution to the specific heat at low temperatures, the surface excitations will affect the thermal properties very little. The reduction of the roton energy near a wall will produce bigger effects in the thermal properties (affecting both films and superleaks). For a saturated film, the effects are still slight, but in a thinner film (or narrow enough channel) the onset temperature for superflow will be reduced considerably; the specific heat will have a broad maximum instead of a λ-anomaly. Both these predictions agree with experiment. (auth)

9177

λ-POINTS IN UNSATURATED HELIUM FILMS. Charles E. Hecht (Univ. of Amsterdam). Physica 24, 1023-8(1958) Dec.

A theoretical study is made of the λ-point in unsaturated helium films and its variation with film thickness. For films of about $\frac{1}{2}$ a liquid layer or less there should be no transition. With increased coverage a transition is possible which is the result of separate λ-transitions

for each liquid layer. The temperature of this transition increases rapidly with film thickness to that of bulk helium at a coverage of about 20 liquid layers. Several solid layers may underlie the first liquid layer. Comparisons with and discussions of the diverse experimental data bearing on this problem are included. (auth)

9178

THE VISCOSITY OF GASEOUS HD BELOW 80°K. J. M. J. Coremans, A. Van Itterbeek, J. J. M. Beenakker, H. F. P. Knaap, and P. Zandbergen (Kamerlingh Onnes Lab., Leiden). Physica 24, 1102-4(1958) Dec.

Data are given for the coefficient of viscosity of HD below 80°K. These results are compared with predictions based on a quantum-mechanical modification of the law of corresponding states. (auth)

9179

SOME SCINTILLATION CHARACTERISTICS OF DIAMOND UNDER ALPHA PARTICLE BOMBARDMENT. J. E. Ralph (King's Coll., London). Proc. Phys. Soc. (London) 73, 233-8(1959) Feb.

Scintillation pulse-height spectra were examined for thirty-five natural diamonds under alpha particle bombardment, and the mean pulse heights V_0 and dispersions η were found to be largely uncorrelated with the type I and type II classification. After-pulses of about 50 msec duration were observed for all specimens and their variation with particle energy was investigated. (auth)

9180

ACCELERATED SELF-CONSTRICTED ELECTRON STREAMS IN PLASMA. J. G. Linhart (European Organization for Nuclear Research). Proc. Roy. Soc. (London) A249, 318-34(1959) Jan. 13.

The mechanism is described of radial oscillations in a neutralized cylindrical electron stream in an accelerating electric field. The analysis is based on the two-fluid model of plasma. Analytical expressions for small amplitude oscillations and numerical solutions for large amplitudes are derived. It is found, when electron-positive ion collisions are taken into account, that for dense streams in low electric fields the radial oscillations (pinch oscillations) can destroy the streaming character of the electron flow and thus prevent its acceleration. (auth)

9181

SCATTERING RADIATION IN THE BODY IN RADIATION FROM 50 TO 200 kv PRODUCTION VOLTAGE. Walter Seelentag and Erich Klotz (Univ. of Munich). Strahlentherapie 108, 112-26(1959) Jan. (In German)

Gradients of doses perpendicular to the direction of the central beam, depth dose curves, and isodoses for radiation between 50 and 200 kv are given using different filters. A close estimate of the secondary radiation received by the body at distances up to 32 cm from the center of the primary beam and to a depth of 22.5 cm can be made. (auth)

9182

AN EXPERIMENTAL DETERMINATION OF THE ELECTRICAL RESISTIVITY OF THE LIQUID ALLOYS Hg–In, Hg–Tl, Ga–In, Ga–Sn, AND OF LIQUID GALLIUM. L. G. Schulz and P. Spiegler (Univ. of Chicago). Trans. Met. Soc. AIME 215, 87-90(1959) Feb.

The electrical resistivity and the temperature coefficient of resistivity were measured with a potentiometric method using pure mercury as a reference material. Measurements were made near room temperature. A detailed study was made of Hg_5Tl_2 near its melting temperature. (auth)

9183

ELECTRICAL CONDUCTIVITY OF MELTS IN THE SYSTEMS NaCl–$ZrCl_4$ AND NaCl–KCl (1:1 molar)–$ZrCl_4$. L. J. Howell and H. H. Kellogg (Columbia Univ., New York). Trans. Met. Soc. AIME 215, 143-5(1959) Feb.

9184

IONIZATION OF AIR BY H^+ AND H_2^+ IONS. R. N. Il'in, V. V. Afrosimov, and N. V. Fedorenko (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 41-8(1959) Jan. (In Russian)

The composition of the secondary ions produced in single collisions between 5 to 180 kev H^+ and H_2^+ ions and air molecules was studied. The following secondary ions were detected: N_2^+, O_2^+, N^+, O^+, N^{2+}, O^{2+}, and Ar^+. The cross sections for secondary ion formation and also the cross section for electron capture by H^+ and H_2^+ ions and total cross section for ionization of air were measured. (tr-auth)

9185

ON ACOUSTIC-ELECTRICAL PHENOMENA IN A DEGENERATE ELECTRON-ION PLASMA. P. S. Zyryanov and H. H. Talutz. Zhur. Eksptl'. i Teoret. Fiz. 36, 145-8(1959) Jan. (In Russian)

Electrical phenomena appearing in an electron-ion plasma in which acoustic waves are travelling are considered. The space attenuation coefficient (absorption coefficient) of the waves is computed. (tr-auth)

9186

A SYSTEM OF MAGNETIC MOMENTS IN A WEAK VARIABLE MAGNETIC FIELD. G. V. Skrotskii and A. A. Kokin (Ural Polytechnic Inst.). Zhur. Eksptl'. i Teoret. Fiz. 36, 169-75(1959) Jan. (In Russian)

A system of magnetic moments is studied which possesses electric exchange and weak magnetic dipole-dipole interactions and is located in an external magnetic field $H_0 + h(t)$. The equation of motion of the magnetization vector is derived with an accuracy to second order terms in perturbation theory for weak variable fields, $h(t) \ll H_0$. The limits of applicability of the equations obtained are discussed. (tr-auth)

9187

PARAMAGNETIC RESONANCE OF F-CENTERS IN STATIC MAGNETIC FIELDS OF ARBITRARY STRENGTH. M. F. Deigen and L. B. Roitsin. Zhur. Eksptl'. i Teoret. Fiz. 36, 176-85(1959) Jan. (In Russian)

The hyperfine interaction of a F-center electron with the magnetic moments of nuclei of the first coordinational sphere surrounding the vacancy is examined for the case when a static field of arbitrary strength is present. The hyperfine splitting was evaluated for F-centers in a KCl crystal. Transitions between hyperfine levels induced by a radiofrequency field are considered. In the absence of an external static field these transitions are found to be allowed. Paramagnetic resonance of F-centers of which only one of the nuclei of the first coordinational sphere has a magnetic moment is considered specially. In this case the frequencies and intensities of paramagnetic resonance absorption depend on the orientation of the crystal in the static magnetic field. The absorption intensity also depends on the orientation of the crystal with respect to the vector of the magnetic field of the wave incident on the crystal. (tr-auth)

9188
CYCLIC MOTION OF CHARGED PARTICLES IN AN ELECTRIC FIELD. A. A. Kolomenskii and Fong Scy-cen (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 271-6 (1959) Jan. (In Russian)

Formulas are derived which describe cyclic motion of charged particles in an electric guide field. A field of this type can be created by a system of special lenses (strong or weak focussing). Resonance acceleration of the particles and in particular their phase stability (auto-phasing) which is similar to the familiar magnetic auto-phasing are considered. The effect of electromagnetic radiation (including quantum fluctuations) on the motion of the electrons in the electric field is examined. A case is also discussed when the particle moves part of the way in an electric field and part in a magnetic field. (tr-auth)

9189
COULOMB EXCITATION OF NEON. D. G. Alkhazov, A. P. Grinberg, I. Kh. Lemberg, and V. V. Rozhdestvenskii (Leningrad Inst. of Physics and Tech.). Zhur. Eksptl'. i Teoret. Fiz. 36, 322-4(1959) Jan. (In Russian)

Graphic illustrations are given of the γ spectra emitted by Coulomb excitation in aluminum targets bombardment by Ne^{20} and Ne^{22} at $\Delta E = 1.63$ and $\Delta E = 1.275$ Mev, respectively. The mean value B(E2) obtained for Ne^{20} at the above energy was $0.041\ e^2 \times 10^{-48}\ cm^4$ and $0.025\ e^2 \times 10^{-48}\ cm^4$ for Ne^{22}. (R.V.J.)

9190
EMISSION OF PARTICLE WITH SPIN 2, UNIFORMLY MOVING IN MEDIUM. A. I. Bedritskii (Vitebsk Pedagogical Inst.). Zhur. Eksptl'. i Teoret. Fiz. 36, 339-41(1959) Jan. (In Russian)

The energy emitted by the particle with spin 2, in uniform motion in a medium, with velocity exceeding the light phase velocity in a given medium (Cherenkov effect), was determined by analogy with the phenomenological theory of this effect in electrons. (R.V.J.)

9191
CRYOGENIC ENGINEERING. Russell B. Scott. Princeton, N. J., D. Van Nostrand Company, Inc., 1959. 377p. $5.60.

The first section of the volume discusses the advances and applications of cryogenics. In the second section the liquefaction of gases is described, in particular the liquefaction of hydrogen and helium. The third section presents methods for the separation of air, helium from natural gas, deuterium from natural hydrogen by distillation, and purification of the gases. In the fourth section cooling by adiabatic demagnetization is discussed. The fifth section presents various types of thermometers used in low-temperature thermometry. In this section various types of insulation, e.g., vacuum, gas-filled powders, fibrous materials, and solid forms, are discussed. Section seven presents containers for storing and transporting liquefied gases. The transfer of liquefied gases through lines is discussed in section eight. The last two sections report the properties of cryogenic fluids and low-temperature properties of structural materials. (W.L.H.)

9192
HOW THE HIGH CINETIC ENERGIES OF COSMIC CORPUSCULAR RAYS MIGHT HAVE BEEN PRODUCED. Friedrich Gruber. Vienna, Selbstverlag, 1959. 3p.

It is proposed that high-energy cosmic positive protons originate outside our universe, the negative protons observed by Swiss physicists being native to our universe. The hypothesis is based on two theses: that the universe is not the whole cosmos and that the elementary charge of the universe is not equal to zero. (T.R.H.)

9193
QUANTUM PARTICLE DYNAMICS. J. McConnell. Amsterdam, North-Holland Publishing Company, 1958. 260p.

The present work is based on lectures extending over two terms which were given for the past ten years to students preparing for the B. Sc. degree at Maynooth. Its purpose is to provide an up-to-date book of convenient size that will enable those with no previous knowledge of relativity or quantum theory to acquire the fundamentals of quantum mechanics, quantum electrodynamics, and meson theory, and to apply them to the study of elementary particles. The mathematical treatment has been kept as simple as possible, and no more than a working knowledge of calculus and of elementary algebra is presumed. (W.D.M.)

9194
SOME METHODS IN NUCLEAR SPECTROSCOPY. Bob Van Nooijen. Thesis, Technische Hogeschool Te Delft, Netherlands, 1958.

Some methods used in nuclear spectroscopy to investigate the disintegration of radioactive nuclei are dealt with. Measuring methods employing scintillation counters, beta spectrometers, coincidence equipment, and angular correlation arrangements are discussed. Angular correlation measurements on Pb^{203}, Ga^{66}, and Co^{60} are described. Radioactive decay of Sc^{48} and B^{48} is investigated. (W.D.M.)

Elementary Particles

9195 AFOSR-TN-59-48
Paris. Ecole Normale Supérieure. Laboratoire de Physique.
K^+-DEUTERIUM SCATTERING—I. Technical Note No. 12. M. Gourdin and A. Martin. [1958]. 16p. Contract AF61(052)-173. (AD-209419).

A preliminary calculation of K^+–deuteron scattering, both elastic and inelastic, is reported. The calculation uses impulse approximation. Final state interactions were provisionally neglected, and in the IBM 704 computation P-waves were ignored. The sensitivity of the results to the I = 0 scattering length was investigated. (W.D.M.)

9196 AFOSR-TN-59-61
Massachusetts Inst. of Tech., Cambridge. Structure of Solids Group and Brookhaven National Lab., Upton, N. Y.
THE USE OF POLARIZED NEUTRONS IN DETERMINING THE MAGNETIC SCATTERING BY IRON AND NICKEL. Technical Report No. 3. R. Nathans, C. G. Shull, G. Shirane, and A. Andresen. Nov. 19, 1958. 22p. Sponsored by AEC; Nat'l. Security Agency; and AFOSR under Contract AF18(603)-84. (AD-209324). $4.80(ph), $2.70(mf) OTS.

The polarized neutron beam technique is discussed and utilized in determining the magnetic scattering by iron and nickel. Procedures for obtaining and using po-

larized beams of monochromatic neutrons are outlined and experimental data are presented on the performance of two polarizing crystals, Fe_3O_4 and 92 Co-8 Fe alloy. The reflectivity of neutrons of different polarization state by single crystals of iron and nickel was studied and used for determining the magnetic scattering amplitudes at different scattering angles. Comparison is made between the observed magnetic form values and theoretical values derived from calculated 3d wave functions. (auth)

9197 AFOSR-TR-58-1058

Massachusetts Inst. of Tech., Cambridge. Structure of Solids Group and Brookhaven National Lab., Upton, N. Y.

POLARIZED NEUTRON STUDIES ON ANTIFERROMAGNETIC SINGLE CRYSTALS. Technical Report No. 4. R. Nathans, T. Riste, G. Shirane, and C. G. Shull. Nov. 26, 1958. 12p. Sponsored by AEC; Nat'l. Security Agency; and AFOSR under Contract AF18 (603)-84. (AD-206986). $3.30(ph), $2.40(mf) OTS.

The theory of neutron scattering by magnetic crystals as given by Halpern and Johnson predicts changes in the polarization state of the neutron beam upon scattering which depend upon the relative orientation of the neutron polarization vector and the crystal magnetic axis. This was investigated experimentally with a polarized beam spectrometer using single crystals of Cr_2O_3 and $\alpha-Fe_2O_3$ in which reside unique antiferromagnetic axes. Studies were made on several different reflections in both crystals for a number of different temperatures both below and above the Neel point. Results support the theoretical predictions and indicate directions for the moments in these crystals consistent with previous work. A more detailed study of the polarization changes in the (111) reflection in $\alpha-Fe_2O_3$ at room temperature on application of a magnetic field was carried out. The results indicate that the principal source of the parasitic ferromagnetism in hematite is essentially independent of the orientation of the antiferromagnetic domains within the crystal. (auth)

9198 NP-7336

Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas.

RADIATIVE CORRECTION TO PION DECAY. Prem Prakash. 1958. 14p. (Notas de Física Vol. IV, No. 16).

The angular and energy distributions of photons are studied in the radiative decay of pions. For secondary process pion decay the Ferri interaction is assumed to be vector–axial Vector. Second order radiative corrections, when pion-lepton interaction is assumed to be elementary, are also studied. The corrected branching ratio of the radiative to the non-radiative decay is found to be $(3.8) \times 10^{-2}$ for the pion decaying into muon and $(2.7) \times 10^{-2}$ for the electron mode of decay. The radiative correction to the decays is 5 to 6%. (auth)

9199 NP-7338

Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas.

ON THE PHASE SHIFTS AND ISOTOPIC SPIN ANALYSIS OF THE SCATTERING OF K^+-MESONS BY NUCLEONS. Erasmo M. Ferreira. 1958. 11p. (Notas de Física Vol. IV, No. 20).

It is suggested that a phenomenological analysis using the impulse approximation of the processes occurring in the scattering of K^+ mesons by deuterons may be used to get the phase-shifts for the T = 0 isotopic spin state. Typical curves are given for the elastic, elastic plus inelastic, and charge exchange scattering differential cross sections of 100-Mev K^+ mesons by deuterons on the assumption that only S waves contribute and for various ratios of the T = 1 and T = 0 isotopic spin states phase-shifts. (auth)

9200 UCRL-8364(Suppl.)

California. Univ., Berkeley. Lawrence Radiation Lab.

ANALYSIS OF THE K^- BEAM TRANSMITTED BY THE MURRAY SPECTROMETER. John N. Dyer. Jan. 27, 1959. 6p. Contract W-7405-eng-48. $0.50(OTS).

An emulsion stack consisting of 216 pellicles of K.5 emulsion was exposed to the K^- beam separated by the coaxial velocity spectrometer. Various measurements made on the stack are reported. (W.D.M.)

9201 UCRL-8372

California. Univ., Berkeley. Radiation Lab.

DECAY MODES OF CHARGED Σ HYPERONS. W. H. Barkas, J. N. Dyer, P. C. Giles, H. H. Heckman, C. J. Mason, N. A. Nickols, and F. M. Smith. June 23, 1958. 3p. Contract W-7405-eng-48. $1.80(ph), $1.80(mf) OTS.

Apparent Σ hyperon decay events in a large emulsion stack of 240 9 in. × 12 in. pellicles were classified into those judged to have occurred at rest and those in flight. Of 36 decay events at rest, 21 secondaries were observed to be protons of about 1675 μ range; these were classified as belonging to the decay mode $\Sigma^+ \rightarrow p + \pi^0$. The remaining 15 Σ-like particles which decayed at rest all produced secondaries of near-minimum grain density compatible with the reaction $\Sigma^+ \rightarrow \pi^+ + n$. Of the events decaying in flights, 23 were decays into protons and 46 were decays into near-minimum secondaries. There were in addition 5 decays into protons and 19 decays into near-minimum secondaries which were not classified definitely as at rest or in flight. An attempt was made to trace the tracks of 35 of the lightly ionizing secondaries. Events in flight in which the decay product was emitted in the backward hemisphere relative to the Σ momentum were given first priority, as these events have secondaries of the shortest ranges. (auth)

9202 AEC-tr-3565

ON AN ESTIMATE OF THE NUMBER OF SECONDARY PARTICLES NEAR CRITICAL ANGLES. (Ob Otsenke Chisla Vtorichnykh Chastits Bliz Predel'nykh Uglov.) G. I. Kopylov. Translated by Lydia Venters (Argonne National Lab.) from a publication of The Joint Inst. of Nuclear Research, Moscow, 1958. 26p. $4.80(ph), $2.70(mf) JCL or LC.

A case is discussed in which the number of secondary particles in the reaction is equal to two. A review of the kinetic equations is given, and the evaluation procedure of the quantity of the particles moving in the most probable directions is made more precise. The simpler equations of the statistics of two-particle decay in the laboratory system are presented. (W.D.M.)

9203 AEC-tr-3588

DISPERSION RELATIONS FOR VIRTUAL PHOTOPRODUCTION. (Dispersionnye Sootnosheniya dlya Virtual'nogo Fotorozhdeniya.) A. A. Logunov, L. D. Solovyev, V. Kukin, A. R. Frenkin, and M. V. Lomonosov. Translated from a publication of the Joint Institute for Nuclear Research Moscow, 1958. 30p. $4.80(ph), $2.70(mf) JCL or LC.

Electron-neutron scattering with the production of a π meson ($e + p \rightarrow p + e + \pi$) is studied. In the lowest approximation with respect to e, this process reduces

to the emission by the electron of a virtual photon, the interaction of which, with a nucleon, leads to the production of a meson. Dispersion relations for the amplitude of this process are written. (W.D.M.)

9204 AEC-tr-3589
A POSSIBLE CASE OF DECAY OF A τ'-MESON WITH EMISSION OF AN ELECTRON-POSITRON PAIR. (Vozmozhnyi Sluchai τ' Mesona s Vyletom Electrono-Positronnoi Pary.) A. Nomofilov. Translated from a publication of the Joint Institute for Nuclear Research, Moscow, 1957. 5p. $1.80(ph), $1.80(mf) JCL or LC.

During the examination of an emulsion plate exposed in the stratosphere, the possibility of the decay of a τ' meson was discovered with the formation of a π^+ meson and an electron-positron pair. Various measurements made in connection with the event are described. (W.D.M.)

9205 AEC-tr-3590
DISPERSION RELATIONS FOR THE SCATTERING OF π-MESONS BY DEUTERONS. (Dispersionsbeziehungen für die Streuung von π-Mesonen an Deuteronen.) F. Kaschluhn. Translated from a publication of The Joint Institute for Nuclear Research, Moscow, 1957. 25p. $4.80(ph), $2.70(mf) JCL or LC.

The dispersion relations for the elastic forward scattering of charged and uncharged π mesons by deuterons are derived, neglecting electromagnetic interaction. The following differences, as compared with the problem of the scattering of π mesons by free nucleons, are found: (1) the scattering amplitude is symmetric in the isotope spin indices of the π meson, and identical dispersion relations for the scattering of positive, negative, and neutral π mesons are obtained; (2) the nonobservable region gives a continuous contribution, and no pole contributions appear; (3) the stream matrix elements diverge in almost the whole nonobservable region, so that one is immediately dependent on the Bogolyubov method of analytic continuation; (4) certain polarization effects concerning the spin of the deuteron appear. Plausible assumptions are made about the form of the stream matrix elements, and the detailed calculations are carried so far that they can be used immediately for a comparison with experimental data. (auth)

9206
A PERIODIC TABLE FOR FUNDAMENTAL PARTICLES. John J. Grebe (Dow Chemical Co., Midland, Mich.). Ann. N. Y. Acad. Sci. 76, 3-15(1958).

A theory of the structure of matter is offered, and the existence of a unique relation among the fundamental particles based on exponentials of $\pi/4$ is pointed out. This relation is used to arrange the fundamental particles in a periodic fashion. (T.R.H.)

9207
THE LATITUDE EFFECT OF THE COSMIC RAY NUCLEONIC COMPONENT IN RELATION TO THE MAGNETIC DIP. Arne Eld Sandström (Uppsala Univ.). Arkiv Fysik 14, 409-18(1959).

Data collected by means of an airborne monitor during a flight across the north polar region and around Asia and Europe are presented. Complete records of the primary results together with a discourse on the latitude effect were presented at the international conference on cosmic rays at Varenna, June 1957 (in print). The data have now undergone further treatment. The C R intensity values were normalized by means of the monitors in Uppsala and on Mt. Norikura and Zugspitze. The differences between the three sets of normalized values turn out to be comparatively unimportant. The latitude effect is studied as a function of the dip. Some discrepancies are discussed as well as the influence of a possible longitude effect. By comparing the geographical coordinates of points of equal C R intensity it is demonstrated that the effective field causing the latitude effect cannot easily be represented by a simple dipole model. Instead the true geomagnetic field, as represented by the dip, appears to be a good first approximation of the field determining the cut off of the primaries. Anomalies can be ascribed to the fact that the tracks of the primaries from being at first determined by a dipole field gradually enter a part of the geomagnetic field differing very little from that at the surface of the earth. (auth)

9208
ON NEUTRON MODERATION. V. V. Smelov. J. Nuclear Energy 8, 239-41(1959) Jan.

This paper was previously abstracted and appears in NSA, Vol. 12, as abstract No. 9357.

9209
DEUTERON DISSOCIATION IN NUCLEAR SCATTERING. A. G. Sitenko. J. Nuclear Energy 8, 241-3(1959) Jan.

This paper was previously abstracted and appears in NSA, Vol. 12, as abstract No. 9495.

9210
BACK SCATTERING OF BETA RADIATION IN MATTER. André Hettler (Laboratoire de Chimie Nucléaire, Strasbourg). J. phys. radium 19, 923-6(1958) Dec. (In French)

A study was made of the various factors affecting the back scattering of beta radiation. The atomic number of the support and the thickness and average atomic number of the source were the factors considered. (auth)

9211
THE ALPHA-PROTON DISCRIMINATION BY MEANS OF D_1 AND K_0 PHOTOGRAPHIC EMULSIONS. Marie Ader and Marie-Paule Cabannes. J. phys. radium 19, 939-42(1958) Dec. (In French)

Methods are given for intensifying the trajectories of α particles and protons in Ilford D_1 and K_0 emulsions. These methods enable one to distinguish satisfactorily one kind of particle from the other, and to count easily grains and gaps in tracks of protons and α particles. (auth)

9212
SECOND RESONANCE IN PION PHOTOPRODUCTION. Michael J. Moravcsik (Univ. of California, Livermore). Phys. Rev. Letters 2, 171-2(1959) Feb. 15.

An experiment to measure the differential cross section for polarized photons in order to determine the second resonating state in pion photoproduction is described. In particular, it is proposed that the differential cross section for photons polarized perpendicular to the production plane be measured. (W.D.M.)

9213
X-RAY PRODUCTION WITH LINEAR ACCELERATORS. Malcolm H. MacGreagor (Applied Radiation Corp., Walnut Creek, Calif.). Nucleonics 17, No. 2, 104-5 (1959) Feb.

Information is given for the evaluation of photon production and associated shielding problems. The following data are presented in graphic form: radiation length as a function of atomic number; maximum photon intensity as a function of electron energy for a high-Z

target of optimal thickness; variation of forward intensity with target thickness; thickness of various common shielding materials required to reduce a narrow, monoenergetic photon beam to one tenth of its incident intensity; buildup factors to be used with the shielding data to find actual attenuation in broad-beam geometry; and the equivalence of photon flux and dose rate to enable treatment of spectrum by energy intervals. The number of photons produced per unit energy range is shown in tabular form. (J.H.M.)

9214

POSSIBLE CONSEQUENCES OF THE ISOBAR AND FIRE BALL MODELS. Z. Koba (Kyoto Univ.) and S. Takagi (Osaka Univ.). Nuovo cimento (10) 10, 755-62(1958) Dec. 1.

Two possible consequences, characteristic of the isobar model and the fire ball model, of multiple meson production are discussed. One is the azimuthal asymmetry of secondary particles, and the other is the apparent anomaly of the inelasticity in meson-nucleon collision. (auth)

9215

A STUDY OF 540 τ-MESON DECAYS. S. McKenna (University Coll., Dublin), S. Natali (Univ. of Padua), M. O'Connell (Inst. for Advanced Studies, Dublin), J. Tietge (Max-Planck Inst. für Physik, Göttingen, Ger.), and N. C. Varshneya (Max-Planck Inst. für Physik, Göttingen, Ger. and Inst. for Advanced Studies, Dublin). Nuovo cimento (10) 10, 763-74(1958) Dec. 1.

A homogeneous sample of 540 τ-meson decays found in emulsion stacks exposed to the Berkeley Bevatron was studied. Most of the events were located by track scanning, and the effects of geometrical and scanning biases were minimized. The results are discussed in detail and then combined with those of a comparably large sample examined by Baldo-Ceolin et al. The most probable spin-parity assignment is 0^- and the deviations of the positive and negative pion energy spectra from those predicted by the relativistic statistical factor, already noted by Baldo-Ceolin et al., were confirmed and estimated. (auth)

9216

THE EFFECT OF THE FINAL STATE INTERACTION ON THE DECAY OF HYPER-^{5}He. Y. C. Tang (Univ. of Illinois, Urbana). Nuovo cimento (10) 10, 780-8(1958) Dec. 1.

The effect of the final state interaction on the decay of hyper-He^5 was studied. It is found that the strong interaction between the α particle and the proton produced in this decay plays a significant role in determining the energy spectra and the angular distributions of the final particles. With the α-p force taken into account as determined by the experimental phase shifts, a simplified calculation indicates that the pion is emitted in the energy range from about 21 to 30 Mev for approximately 90% of the events, and that the proton is scattered predominantly in the backward direction in the α-p center of mass system. These findings are in fair agreement with Hill's analysis of recent experimental observations on the decay of hyper-He^5. (auth)

9217

A NOTE ON THE INELASTIC CONTRIBUTIONS TO THE ELASTIC SCATTERING OF HIGH-ENERGY ELECTRONS FROM HELIUM. P. O. Davey and H. S. Valk (Univ. of Oregon, Eugene). Nuovo cimento (10) 10, 789-96(1958) Dec. 1.

An estimate is made of the contribution of nonradiative inelastic processes to the elastic scattering of high-energy electrons from He^4. It is shown that at the presently available energies and scattering angles the dominant process is electrodisintegration, and that this and other effects may be expected to give a correction to the differential elastic scattering cross-section of several percent, the maximum values occurring at high-energies and backward scattering angles. (auth)

9218

ON THE RELATION BETWEEN VELOCITY AND MASS OF THE ELECTRON. S. Raboy and C. C. Trail (Argonne National Lab., Lemont, Ill.). Nuovo cimento (10) 10, 797-803(1958) Dec. 1.

It is suggested that the elastic scattering of electrons from electrons be used to verify the Lorentz law of mass variation with velocity. The kinematics of such a process yield angular dependences which are sensitive to the model used. An independent measurement of the velocity of the incident particle is necessary to complete the measurement in a logical fashion. It is shown that two other experiments reported in the literature are deficient in this respect. (auth)

9219

HIGH Z NUCLEI IN COSMIC RADIATION. V. Bisi, R. Cester, C. M. Garelli, and L. Tallone (Univ. of Turin and Istituto Nazionale di Fizica Nucleare, Turin). Nuovo cimento (10) 10, 881-91(1958) Dec. 1.

Adding the results obtained by measuring the charges of 117 heavy nuclei ($Z \geq 10$) to those obtained in a previous paper, the values of the ratio $N(Z \geq 15)/N(Z \geq 10)$ at flight altitude and at the top of the atmosphere and of the ratio $N(Z = 26)/N(Z \geq 10)$ at flight altitude, at the top of the atmosphere, and at the C.R. source were determined. It results that the chemical composition of the C.R. source differs from the average composition of the universe, being much richer in heavy nuclei ($Z \geq 15$) and in particular in iron. The absorption mean free path in air was also determined studying the zenith angle dependence of C.R. flux. (auth)

9220

INELASTIC SCATTERING OF ELECTRONS FROM ^{6}Li AND ^{14}N. P. Cazzola (Univ. of Padua) and C. Foglia (Univ. of Parma, Italy). Nuovo cimento (10) 10, 913-15(1958) Dec. 1.

The inelastic scattering of electrons from C^{12} was calculated making use of the shell model. There is good agreement between calculated and experimental results. The strong increase of the ratio of inelastic to elastic scattering with energy is given correctly. The absolute value of the inelastic scattering differs at most by a factor of 3 from the experimental value. Calculations similar to those on C^{12} were made from Li^6 and N^{14}. No experimental data are as yet available on these nuclei. (A.C.)

9221

Λ INTERACTIONS IN HYDROGEN. Frank S. Crawford, Jr., Marcello Cresti, Myron L. Good, Frank T. Solmitz, M. Lynn Stevenson, and Harold K. Ticho (Univ. of California, Berkeley). Phys. Rev. Letters 2, 174-7 (1959) Feb. 15.

Six cases of Λ hyperons interacting with protons in a liquid hydrogen bubble chamber were found. The classes of Λ interactions were $\Lambda + p \rightarrow \Lambda + p$ (4 events) and $\Lambda + p \rightarrow \Sigma^+ + n$ (2 events). No examples of the $\Lambda + p \rightarrow \Sigma^0 + p$ reaction were found. The cross sections are computed for the reactions and for the inverse reactions. (W.D.M.)

9222
RADIATIVE DECAY OF THE MUON. Toichiro Kinoshita (Cornell Univ., Ithaca, N. Y.) and Alberto Sirlin (Columbia Univ., New York). Phys. Rev. Letters 2, 177-8 (1959) Feb. 15.

The photon spectrum emitted in muon decay is derived in the framework of the two-component theory of the neutrino. The possibility that this effect may be observed with present techniques is discussed. (W.D.M.)

9223
LONGITUDINAL POLARIZATION OF THE ELECTRONS FROM THE DECAY OF UNPOLARIZED POSITIVE AND NEGATIVE MUONS. G. Culligan, S. G. F. Frank, and J. R. Holt (Univ. of Liverpool). Proc. Phys. Soc. (London) 73, 169-77(1959) Feb.

The polarization of electrons from the decay of unpolarized positive and negative muons was detected by the method of transmission of bremsstrahlung through magnetized iron. It is shown that the positrons have positive helicity and the negatrons negative helicity, thus providing a clear demonstration of violation of invariance under charge conjugation. It follows on the basis of the two component neutrino theory that the neutrino associated with the decay of the pion has negative helicity and the anti-neutrino positive helicity. The agreement of this with recent results for the neutrino in β decay lends support to this theory and confirms the law of conservation of leptons. (auth)

9224
KNOCK-ON ELECTRONS FROM COSMIC-RAY μ-MESONS. J. L. Lloyd and A. W. Wolfendale (Univ. of Durham, Eng.). Proc. Phys. Soc. (London) 73, 178-84(1959) Feb.

A cloud chamber study was made of the electron secondaries produced by fast μ mesons in iron and lead plates and cloud chamber gas. The mean probability of a meson emerging from a plate accompanied by a single electron was accurately determined for mesons in the momentum range 0.5 to 200 Bev/c. This probability is $9.0 \pm 0.4\%$ for 55 g cm^{-2} iron and $5.80 \pm 0.15\%$ for 11.5 g cm^{-2} lead. A search was made for any anomalous dependence of electron production upon primary momentum or sign of charge but none was detected. (auth)

9225
A MEASUREMENT OF THE EFFECT OF THE COULOMB FIELD OF A NUCLEUS ON THE DECAY RATE OF NEGATIVE MUONS. A. Astbury, M. Hussain, M. A. R. Kemp, H. H. Lipman, H. Muirhead, R. G. P. Voss, and A. Kirk (Univ. of Liverpool). Proc. Phys. Soc. (London) 73, 314-16(1959) Feb.

Negative muons brought to rest in matter disappear as a result of two processes, decay and nuclear capture. The rate of loss in a material of atomic number Z is $\lambda_1(Z)$, given by $\lambda_1(Z) = \lambda_d(Z) + \lambda_c(Z)$, where $\lambda_d(Z)$ and $\lambda_c(Z)$ are the decay and capture rates, respectively. Measurements of $\lambda_1(Z)$ were made for a number of materials. The rates $\lambda_c(Z)$ and $\lambda_d(Z)$ may be obtained separately by making a measurement of the stopped fraction of muons which emit an electron, $f = \lambda_d(Z)/\lambda_1(Z)$. Experimental difficulties make an absolute measurement difficult in a single material. (A.C.)

9226
SHOWERS PRODUCED BY 100 TO 400 Mev POSITRONS. Yu. D. Prokoshkin and Tang Syao Wai (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 36, 10-16(1959) Jan. (In Russian)

Cascade curves for 101, 294, and 407 Mev positrons in lead and copper were measured. The curves obtained are in agreement with shower curves computed by the Monte-Carlo method. Functions approximating the cascade curves were found. (tr-auth)

9227
CLOUD CHAMBER INVESTIGATION OF THE CORES OF EXTENSIVE AIR COSMIC RAY SHOWERS. O. I. Dovzhenko, S. I. Nikolskii, and I. V. Rakobolskaya (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 17-23(1959) Jan. (In Russian)

The results of an experimental investigation of the core structure of extensive atmospheric cosmic-ray showers are presented. Photographs of cores of extensive shower cores traversing the chamber are given. (tr-auth)

9228
A HODOSCOPE INVESTIGATION OF THE PENETRATING COMPONENT OF EXTENSIVE AIR SHOWERS. R. E. Kazarov (Inst. of Physics, Academy of Sciences, Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 49-51 (1959) Jan. (In Russian)

A relation of the type $N_\mu \sim E_0^{\varkappa}$ for the flux of μ mesons possessing energies ≥ 0.41 Bev and moving at a distance from 0 to 24 m from the axis of extensive air showers was investigated. It is shown that for energies $1.54 \times 10^{14} \leq E_0 \leq 3.14 \times 10^{15}$ ev the exponent is $\varkappa = 0.42 \pm 0.14$. (tr-auth)

9229
DOUBLE SCATTERING OF RELATIVISTIC π-MESONS ON NUCLEONS. V. A. Astaf ev (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 98-107(1959) Jan. (In Russian)

The formalism of the double scattering theory based on invariance of the interaction Hamiltonian under rotations in isotopic and x-space is extended to relativistic energies. The expression for the differential cross section was obtained in a form which is convenient for analysis of the experimental data. To illustrate application of the formal theory the problem is considered in the approximation of radiation damping theory. (tr-auth)

9230
TWO-NUCLEON LS-POTENTIAL IN NONRELATIVISTIC MESON THEORY. Yu. V. Novozhilov and I. A. Terentev (Leningrad State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 129-39(1959) Jan. (In Russian)

The potential between nucleons is linearly calculated with respect to velocity approximation (recoil being partly accounted for) without aid of perturbation theory. A potential was found which decreases as e^{-2R} and depends on the coupling constant as well as on the $(\pi-N)$-scattering cross section. (tr-auth)

9231
ACCOUNT OF RESONANCE $\pi-\pi$-INTERACTION WITHIN THE FRAMEWORK OF FERMI'S STATISTICAL THEORY OF MULTIPLE PRODUCTION OF PARTICLES. V. I. Ruskin (Inst. of Nuclear Physics, Academy of Sciences, Kazakh SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 164-8(1959) Jan. (In Russian)

An attempt is made to take into account the resonance interaction between two π mesons on the basis of Fermi's statistical theory. The concrete case of $\pi^- - p$-scattering at an energy of 4.5 Mev is considered. Production of strange particles is taken into account. The results are compared with the experiments. (tr-auth)

9232

ON THE GREEN'S FUNCTION FOR THE RESONANCE RADIATION DIFFUSION EQUATION. B. A. Veklenko (Moscow Inst. of Power Engineering). Zhur. Eksptl'. i Teoret. Fiz. 36, 204-11(1959) Jan. (In Russian)

An analytic expression for the Green's function of the resonance radiation diffusion equation was deduced for the case of a homogeneous infinite space. The properties of the Green's function were investigated for a dispersion and Doppler shapes of the spectral lines. An analytic expression was derived for the mean time required for a photon to move as a result of diffusion over a distance greater than some prescribed value. In conclusion the Green's function was determined for the stationary equation, and for a dispersion shape of the spectral line its asymptotic expression is given in explicit form. (tr-auth)

9233

POLARIZATION EFFECTS IN THE CAPTURE OF THE Σ^--HYPERON BY THE DEUTERON. S. G. Matinyan and O. D. Cheishvili (Inst. of Physics, Academy of Sciences, Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 212-15(1959) Jan. (In Russian)

Absorption of the Σ^- hyperon by a deuteron with formation of an Λ^0 particle is examined phenomenologically. A study of the polarization correlations of these particles yields some definite information on the polarization of the Σ^- hyperon. (tr-auth)

9234

ON THE CHERENKOV RADIATION OF AN ELECTRON MOVING IN A MEDIUM WITH SPATIAL DISPERSION. V. N. Agranovich, V. E. Pafomov, and A. A. Rukhadze (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 238-43(1959) Jan. (In Russian)

Cherenkov radiation in an isotropic gyrotropic medium is examined with consideration of spatial dispersion. The angular distribution of the Cherenkov radiation intensity and exit of the radiation through the boundary of the medium are discussed. (tr-auth)

9235

GENERALIZED FORM OF THE DEPENDENCE OF THE π-MESON PHOTOPRODUCTION CROSS SECTIONS OF COMPLEX NUCLEI ON THE NUMBER OF NUCLEONS. A. S. Belousov, B. B. Govorkov, and V. I. Goldanskii (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 244-8(1959) Jan. (In Russian)

A generalized formula is deduced which describes the dependence of π-meson photoproduction cross sections of complex nuclei on the number of nucleons, account being made of ordinary reabsorption processes as well as of two-nucleon absorption of mesons at the instant of creation. Two types of calculations are presented: (1) calculation for a given wave function of the nucleon pair assuming uniform distribution of nucleon density in the nucleus and (2) a phenomenological calculation in which the wave function is not prescribed but the nucleon density in the nucleus is assumed to be of the Fermi type. (tr-auth)

9236

CHARGE SYMMETRY PROPERTIES AND REPRESENTATIONS OF THE EXTENDED LORENTZ GROUP IN THE THEORY OF ELEMENTARY PARTICLES. V. I. Ogievetskii and Chou Kuang-chao (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 36, 264-70 (1959) Jan. (In Russian)

The extended Lorentz group which includes the complete Lorentz group and charge conjugation operation is considered. It is shown that the use of irreducible projective representations of this extended group requires the existence of charge multiplets. Charge symmetry and pair production of strange particles follow from invariance under reflections, charge conjugation and the laws of conservation of electric and baryon charges. The Pauli–Gursey transformation holds for free nucleons. The condition of invariance under this transformation also in the case of interaction leads to isobaric invariance in strong interactions of all particles. (tr-auth)

9237

DEPOLARIZATION OF THE μ^--MESON IN MESIC ATOM TRANSITIONS. V. A. Dzhrbashyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 277-82(1959) Jan. (In Russian)

A method for calculation of the depolarization of μ^- mesons in mesic atom transitions is proposed. The estimation of the expected μ^--meson depolarization is in good agreement with available experimental data. (tr-auth)

9238

A POSSIBLE METHOD FOR DETERMINATION OF THE PARITY OF STRANGE PARTICLES. S. M. Bilenkii (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 36, 291-2(1959) Jan. (In Russian)

It is suggested that parity of hyperons and K-mesons can be determined by investigation of the left-right asymmetry in the $\pi(K) + p \rightarrow Y + K(\pi)$ reactions with a polarized proton target. (tr-auth)

9239

ON THE MOMENT OF INERTIA OF A MANY-PARTICLE SYSTEM. I. Yu. K. Khokhlov (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 295-9(1959) Jan. (In Russian)

The problem of determination of the moment of inertia is considered. The simplest consequence of the formula obtained is that the moment of inertia does not vanish and is not very small (as compared with the moment of inertia of a solid body) even in the case of a spherically symmetrical system. (tr-auth)

9240

ON PERIPHERAL INTERACTIONS BETWEEN ELEMENTARY PARTICLES. L. B. Okun and I. Ya. Pomeranchuk. Zhur. Eksptl'. i Teoret. Fiz. 36, 300-12 (1959) Jan.

Peripheral interaction between strongly interacting elementary particles can be phenomenologically described in an adequate manner by existing meson theory. It is suggested that the contribution of peripheral interaction can be assessed by determining from experiment the amplitudes of various processes corresponding to large orbital angular momenta since the latter correspond to large impact parameters. Comparison of the amplitudes found experimentally with those computed theoretically should permit one to obtain some important quantities characterizing strong interactions of elementary particles. Some quantities of this type are the renormalized coupling constants interaction of π mesons with nucleons and hyperons, the renormalized coupling constants for interaction of two π mesons, π meson and K meson, etc. (tr-auth)

9241

PARTICLE ENERGY LOSSES DUE TO THE EXCITATION OF LONGITUDINAL WAVES. B. A. Lysov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 321-2(1959) Jan. (In Russian)

The theory of the Cherenkov effect was evolved for the case of longitudinal electromagnetic wave emission by electrons. The investigation was limited to isotropic media. In the examined case, the ordinary Lagrangian could not be used, hence the Fok–Podolsky Lagrangian was generalized. (R.V.J.)

9242

CORRELATION OF POLARIZATIONS IN COULOMB ELECTRON AND μ MESON SCATTERING ON LIGHT NUCLEI, CONSIDERING RADIATIVE CORRECTIONS. I. G. Ivanter (Inst. of Scientific Informations, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 325-6(1959) Jan. (In Russian)

An error was found in the published generalized expression for Coulomb electron scattering at fixed spin and particle directions before and after scattering. A previously developed method of projection operators was applied in the analysis of radiative corrections to the above expression. The second Born approximation and longitudinal polarization measurements were used in the experimental studies of radiative corrections. (R.V.J.)

9243

ELASTIC SCATTERING OF POLARIZED DIRAC PARTICLES BY SHORT-RANGE CENTER FORCE CONSIDERING ATTENUATION THEORY. I. I. Guseinov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 331-3(1959) Jan. (In Russian)

The elastic scattering of Dirac particles by a stationary, short-range, central force, considering the attenuation, was investigated previously, and polarization effects were evaluated for a specific case of δ-potential scattering. Another case of elastic scattering of Dirac particles by an arbitrary, short-range, central force considering polarization effects according to the theory of attenuation is investigated using the symbols from the previous works. (R.V.J.)

9244

PAIR PRODUCTION BY CIRCULARLY POLARIZED PHOTON. I. M. Nadzhafarov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 337-9(1959) Jan. (In Russian)

Electron-positron pair production in a point nucleus field by a circularly polarized photon was studied with generalizations suitable for all energy and angular magnitudes. (R.V.J.)

9245

INTRODUCTION TO NEUTRON PHYSICS. L. F. Curtiss. Princeton, N. J., D. Van Nostrand Company, Inc., 1959. 398p.

A summary of the fundamental properties of the neutron is given, and discussions are included on the classification of neutrons as to energy. More detailed information is presented on the following: the interactions of neutrons with other nuclear particles and matter; neutron sources and detection; operating characteristics of spectrometers and monochromators; calibrations and standards for neutron measurements; and neutron shielding and protection of personnel. Some formulas of neutron physics are also included. (J.H.M.)

Heat Transfer and Fluid Flow

9246 AECU-3921

Iowa. State Univ., Iowa City.

FLOW THROUGH MICROPOROUS MEDIA. THEORY OF FLOW PHENOMENA. Lenard O. Rutz and Karl Kammermeyer. Dec. 1, 1958. 104p. Contract AT(11-1)-237. $2.50(OTS).

Flow through microporous media, in particular consolidated media such as barriers, is likely to involve flow mechanisms starting with laminar flow and extending to the Knudsen flow region. The flow mechanisms of pure gas flow are treated theoretically, covering the range from laminar flow through slip flow and transition flow to the Knudsen flow. In this manner, an attempt is made to present a unified picture of interrelations and of characteristic features for flow through individual capillaries and through microporous media, respectively. A great deal of the material was obtained from previously published work of many investigators in the field. The flow of gases (or vapors) through microporous media is influenced by the capillary nature, and therefore, adsorptive properties of the solid. Thus, theoretical treatises are also presented on adsorbate–adsorbent interaction, and mechanisms of fluid motion of the adsorbed phase through the microporous medium. (auth)

9247 AECU-4022

Purdue Univ., Lafayette, Ind.

VELOCITY AND TEMPERATURE DISTRIBUTIONS ABOUT A HORIZONTAL CYLINDER IN FREE CONVECTION HEAT TRANSFER. Final Report. Alexander Sesonske. Sept. 15, 1958. 17p. Contract AT(11-1)-432. (PRF-1425). $3.30(ph), $2.40(mf) OTS.

Measurements were made at one set of conditions of the velocity and temperature distributions about a single, one-inch diameter, cooled, horizontal cylinder immersed in a volume-heated liquid. The results, when expressed in a dimensionless basis recommended by Hermann, were in good agreement with predictions based on vertical plate geometry. (auth)

9248 AECU-4036

Northwestern Univ., Evanston, Ill. Technological Inst.

DISPERSION OF FLUID FLOW IN POROUS MEDIA. A. Ogata and R. B. Banks. Jan. 1, 1959. 70p. Contract AT(11-1)-353. $10.80(ph), $3.90(mf) OTS.

Results of an investigation concerned with the phenomenon of dispersion in porous media flow are presented. Major emphasis was placed on the problem of one-dimensional, longitudinal flow in porous media, from both theoretical and experimental viewpoints. The governing differential equation for the dispersion of a fluid transporting a solute as it flows through porous media closely resembles the heat conduction equation. For prescribed boundary conditions, solutions to these equations were obtained. Experiments were conducted in which these boundary conditions were closely simulated and the experimental results were analyzed in the light of the theoretical expressions. (auth)

9249 APEX-460

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

STEADY-STATE AND TRANSIENT THERMAL STRESSES IN A TUBE SUBJECTED TO INTERNAL HEATING. H. A. Eagle and A. L. Ross. Oct. 1955. 25p. Contracts AF33(600)-38062 and AT(11-1)-171. $1.00(OTS).

A method of solution is presented for thermal stresses caused by either steady-state or transient heat flow in an internally heated tube. The heat conduction equations are solved by the method of finite differences and are programmed for solution by high-speed digital computers. By coding the problem for computers of this type, thermal stresses for tubes of different materials, thermal properties, and heat-generation histories are readily attainable. (auth)

9250 AECU-4043

[South Carolina. Univ., Columbia.]

DEPARTMENT OF CHEMICAL ENGINEERING PROGRESS REPORT [FOR] SEPTEMBER 1, 1957 THROUGH JUNE 30, 1958. PART I. THERMAL CONDUCTIVITY OF DEUTERIUM OXIDE. B. L. Baker and S. T. Goforth, Jr. 26p. Contract AT(38-1)-118. $4.80(ph), $2.70(mf) OTS.

The thermal conductivity of heavy water was found to vary from 0.345 at 105°F through a maximum of 0.375 at about 265°F to 0.371 at 339°F. The conductivity was determined by a steady-state method in a cylindrical apparatus having an over-all length of 11.35 inches and a liquid layer about 0.061 inch thick. A temperature drop of approximately one degree Fahrenheit across the liquid was maintained. The temperature drop was measured with thermistors. The apparatus was calibrated with light water. The error in determining the conductivity of heavy water was estimated to be less than 0.8% plus the uncertainty in known determinations for light water. (auth)

9251 AFOSR-TN-59-37

Technion Research and Development Foundation Ltd., Haifa, Israel.

RESEARCH ON CROSS-STRESSES IN THE FLOW OF LIQUIDS. Technical Report Summarizing the Research for the period October 1, 1957 to September 30, 1958. Markus Reiner. 13p. Contract AF61(052)-10. (AD-209209).

An instrument is described which works as a centripetal pressure pump with incompressible liquids. (auth)

9252 CEA-846

France. Commissariat a l'Energie Atomique, Paris.

TRANSFERT DE CHALEUR A DENSITE DE FLUX ELEVEE ENTRE PAROI ET EAU AVEC EBULLITION LOCALE A LA PAROI. (Heat Transfer With High Flux Density Between a Wall and Water, With Local Boiling at the Wall.) J. Baumier, M. Robin, B. Schwab, and L. Vautrey. June 1958. 28p.

The aim of the present study was to determine the relationship between the temperature of a hot wall and that of a cooling fluid under conditions where this fluid is subject to local boiling at the wall. Attention was directed particularly to the aspect of the phenomenon in the transition region between the classical turbulent convection and the convection with local boiling. The tests were carried out with water at an average temperature of 50°C circulating in an annular space, the heat flux deriving from the inside tube. The flux region used corresponds to a transmission by normal turbulent convection and by convection with the appearance of local boiling. The results obtained in the field of normal convection follow the classical laws; the results in the zone where local boiling appears are in correct agreement with the formulas proposed by other authors for higher heat fluxes. (auth)

9253 RDB(W)/TN-198

United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.

HEAT TRANSFER EXPERIMENTS WITH SODIUM POTASSIUM ALLOY. A. E. Jenkins and G. McKee. Mar. 1955. 25p.

A description is given of experiments in which the heat transfer coefficients between two annuli each carrying a flow of sodium–potassium alloy were measured. For Peclet numbers above 60 the results are in good agreement with the theoretical values. For Peclet numbers below 60 the results do not agree with theory but are of doubtful accuracy. Circumferential temperature variations caused by eccentric positioning of one of the tubes of the exchanger have been measured for varying degrees of eccentricity. The maximum values obtained are only a fraction of those predicted by the simple theory. (auth)

9254 SC-4204(TR)

Sandia Corp., Albuquerque, N. Mex.

EXPERIMENTAL PRESSURE DISTRIBUTIONS AND FORCE COEFFICIENTS ON BLOCK FORMS FOR VARYING MACH NUMBER, REYNOLDS NUMBER, AND YAW ANGLE. Dorris M. Hankins. Jan. 1959. 142p. Contract [AT(29-1)-789]. $2.75(OTS).

Wind tunnel tests were performed to determine pressure distributions and normal force coefficients on three block forms on mounting planes. The dimension ratios of the blocks were 1:1:1, 1:1:2, and 1:1:4. Results are given for variation in Mach number from 0.066 to 0.8, in Reynolds number from 0.28×10^6 to 4×10^6, and in yaw angle from 0 to 90 degrees. Results show a Reynolds number independence over the range examined. Windward face force coefficients for a given block form are approximately proportional to the ratio of impact to dynamic pressure. Pressure distribution and resultant coefficients are affected by mounting planes. (auth)

9255 CEA-tr-R-565

ECHANGE THERMIQUE PAR METAUX LIQUIDES. (Thermal Exchange by Liquid Metals.) S. S. Kutateladze (Koutateladze), V. M. Borishanskii (Borichansky), and I. I. Novikov. Translated into French by B. Vinogradoff from Atomnaya Energ. 4, 422-36(1958). 43p. (Includes original, 17p.)

A review is presented on the studies of heat transmission between a solid surface and liquid metals. The results of investigations on the thermal exchange during discharge through long and short pipes and through slits, during flowing around bundles of rods or groups of plates, during transverse flow around cylinders by free convection, and by condensation of liquid vapor were discussed. The effects of addition substances on the intensity of the heat exchange were studied. Problems connected with boiling of the liquid metals as well as the effect of wetting on the hydraulic resistance and the intensity of thermal exchange were also considered. Some formulas which permit the calculation of the thermal exchange are presented. 30 references. (tr-auth)

9256

HEAT TRANSFER. E. R. G. Eckert, James P. Hartnett, and T. F. Irvine, Jr. (Univ. of Minnesota, Minneapolis). Ind. Eng. Chem. 51, 453-65(1959) Mar.

A review on heat transfer is presented including the sub-topics: conduction, channel flow, boundary layer

flow, flow with separated regions, transfer mechanisms, natural convection, convection from rotating surfaces, transpiration and mass transfer cooling, change of phase, radiation, liquid metals, measurement techniques, and applications. 318 references. (T.R.H.)

9257
DISAPPERANCE OF THE ISOTHERMAL DISCONTINUITY AT HIGH EMISSION DENSITY. V. A. Belokon (Inst. of Chemical Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 341-3(1959) Jan. (In Russian)

Assuming that gas is a continuous heat-conducting medium retaining local thermodynamic equilibrium, it is shown that in sufficiently hot gases the isothermal discontinuity disappears. The equation obtained corresponds to the transition of isothermal discontinuity into isothermal sound. (R.V.J.)

Nuclear Properties and Reactions

Refer also to abstracts 8753, 9425, 9427, 9428, 9429, 9430, 9433, and 9465.

9258 APEX-467
Nuclear Development Corp. of America, White Plains, N. Y.
SOME NEUTRON CROSS SECTIONS FOR MULTIGROUP CALCULATIONS. N. Tralli. June 30, 1958. 212p. For General Electric Co. Aircraft Nuclear Propulsion Dept. Contracts AF33(600)-38062 and AT(11-1)-171. Subcontract AT-70. $3.50(OTS).

Chapters 1 through 4 deal, respectively, with neutron diffusion data, neutron sensor data, inelastic scattering data, and photon activation data. Chapter 5 consists of a list of the references to the literature cited in the first four chapters. The neutron diffusion data consist of the absorption, scattering, transport, and slowing-down cross sections. The neutron sensor data are concerned with the activation cross section σ_{n,β^-} for the production of negative beta particles. The inelastic scattering data consist of the neutron inelastic scattering cross section, the spectrum of the inelastically scattered neutrons and the inelastic slowing-down cross section. The photon activation data consist of the neutron cross section for photon production $\sigma_{n,\gamma}$, the total photon energy release and the photon energy distribution spectrum. All cross sections are reported as obtained and as group-averaged and digitalized cross sections. The group-averaged and digitalized cross sections are defined. The groups over which the cross sections were to be averaged, the averaging procedure, and the digitalization procedure were specified so that the results obtained would be readily usable in the GE reactor calculation procedure. In addition, thermal averages of the neutron diffusion cross sections are reported. (auth)

9259 LAMS-2255
Los Alamos Scientific Lab., N. Mex.
NEUTRON CROSS SECTIONS FOR FAST AND INTERMEDIATE NUCLEAR REACTORS. C. B. Mills. Oct. 1958. 171p. Contract W-7405-eng-36. $3.00(OTS).

A neutron transport equation which was solved numerically has been connected with multigroup neutron cross sections and critical assemblies to display the area of coverage and range of errors. The cross sections, critical assemblies, and results are tabulated. (auth)

9260 NAA-SR-3377
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
THERMAL NEUTRON SPECTRUM IN HARMONICALLY BOUND HYDROGEN MODERATORS. E. R. Cohen and E. U. Vaughan. Jan. 15, 1959. 24p. Contract AT-11-1-GEN-8. $0.75(OTS).

A model representing the moderation of neutrons in a crystalline hydride moderator in which the motion of the hydrogen is severely restricted by the chemical bonds which tie it to an essentially infinite crystal matrix is considered. It is assumed that the hydrogen is bound in an isotopic harmonic oscillator potential well, the possible energy levels are uniformly spaced with separation $h\nu$, and energy transfers occur only in hydrogen–neutron collisions. (W.D.M.)

9261 NP-7337
Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas.
DISTRIBUIÇÃO ANGULAR EM PROCESSOS DE REMOÇÃO DE UM NEUTRON DO Be^9 A BAIXAS ENERGIAS. (Angular Distribution in the Processes of Stripping of a Neutron from Be^9 at Low Energies.) A. G. de Pinho Filho. 1958. 26p. (Notas de Física Vol. IV, No. 17.)

The use of a two-body model for Be^9 permits, within the Born approximation, a complete calculation of the differential cross sections for the reactions $Be^9(p,d)$ and $Be^9(d,t)$. The reactions are considered as "pick-up" processes, and the influence of the Coulomb field in the angular distribution is not considered. The results are compared with experimental data. (auth)

9262 NYO-2150
Yale Univ., New Haven.
CROSS-SECTION AND PROTON POLARIZATION IN THE PHOTODISINTEGRATION OF THE DEUTERON. W. Zernik, M. L. Rustgi, and G. Breit. Jan. 9, 1959. 11p. Contract AT(30-1)-1807. $3.30(ph), $2.40(mf) OTS.

The differential cross sections and proton polarization were computed for six gamma-ray energies in the range 20 to 200 Mev. Approximations were used in order to determine the relative importance of the various transitions. The results are tabulated. (A.C.)

9263 UCRL-5351
California. Univ., Livermore. Lawrence Radiation Lab.
SEMI-EMPIRICAL NEUTRON CROSS SECTIONS. PART II, VOLUME I. 0.5–15 MEV. Robert J. Howerton. Nov. 1958. 274p. Contract W-7405-eng-48. $4.00(OTS).

Several cross section curves are plotted for most of the elements and isotopes considered. For most of the elements and isotopes, the total cross section has been measured in the energy range under consideration. For elements with A > 40, optical model calculations have been made for the total cross section in the energy range from 7 to 14 Mev. The calculations of Fernbauch and Bjorklund were used to supplement the experimental data where there was a shortage of measured values or where an ambiguity existed between several measured values. (W.D.M.)

9264 WADC-TR-58-79
Technical Research Group, New York.
CROSS SECTIONS FOR NEUTRON-INDUCED REACTIONS: A REVIEW OF PHENOMENOLOGICAL DE-

SCRIPTIONS. David M. Chase, Carl N. Klahr, and Aaron Temkin. Feb. 28, 1958. 138p. Project No. 7-(1-7112). Contract AF33(616)-3616. (TRG-10-14; AD-155849).

The descriptive framework for treating nuclear reactions and current phenomenological models and methods for calculating nuclear cross sections are reviewed with particular reference to neutron-induced events at energies up to ~14 Mev. General scattering theory for two-body systems is developed. Resonance theory is described from an elementary point of view, and results of the derivative-matrix formulation are discussed. In connection with the gross-structure (energy-average) problem and the continuum region, an account is given of the strong-interaction and optical models. The rotational-optical model for deformed nuclei is described. The statistical model for branching ratios is developed in a general form. Considered in the course of this development are the generalized gross-structure problem, branching ratios in the limit of continuous density of residual levels, the relation of the statistical assumptions to resonance theory, and inclusion of radiative capture. Some comparison of calculations with experimental results is included. (auth)

9265 WADC-TR-58-88

Texas Nuclear Corp., Austin, Tex.

INELASTIC SCATTERING OF FAST NEUTRONS FROM NITROGEN AND OXYGEN. [Period covered]: August 31, 1956 to February 28, 1958. Norman A. Bostrom, Ira L. Morgan, J. Thomas Prud'homme, Pablo L. Okhuysen, and Abdul R. Sattar. Feb. 1958. 65p. Project No. 7112. Contract AF33(616)-3817. (AD-151028; PB-151244). $1.75(OTS).

An investigation of the inelastic scattering of neutrons from oxygen and nitrogen was made in order to determine inelastic neutron cross sections and gamma-ray production cross sections. A single crystal NaI(Tl) spectrometer was used to detect gamma rays from oxygen and nitrogen in the neutron energy ranges from 3.4 to 5.05 Mev and from 14.9 to 17 Mev. Cross sections for production of the 2.30 Mev gamma ray in N^{14} and the 6.1 Mev gamma ray in O^{16} were measured at several energies. An associated particle time-of-flight technique was developed and used to measure the energy distribution of the neutrons inelastically scattered from oxygen at 14.9 Mev. A pulsed beam time-of-flight spectrometer was constructed and tested and some preliminary results obtained. A detailed discussion of the time-of-flight apparatus is included. (auth)

9266 AEC-tr-3567

A NEW METHOD OF MEASURING RELAXATION TIMES, AND THE SPIN OF Cr^{53}. (Über Eine neue Methode zur Messung von Relaxationszeiten und über den Spin von Cr^{53}.) K. Halbach. Translated for Argonne National Lab. from Helv. Phys. Acta 27, 259-82(1954). 33p. $6.30(ph), $3.00(mf) JCL or LC.

The effects and applicabilities of a modulation effect which can occur in the recording of nuclear induction signals on a registering instrument are discussed. The essential features of the phenomenological theory of Bloch (the basis for the treatment of this effect) are reviewed. Taking into account the modulation effect, the nuclear spin of Cr^{53} was determined. The measurements were carried out in the field of a water-cooled electromagnet with a pole diameter of 25 cm and a pole distance of 4 cm. The field inhomogeneity, with a maximum field of 21,000 gauss and a sample volume of 4 cm^3, amounts to approximately 0.1 gauss. The magnetic current is electronically stabilized, and the relative stabilization amounts, together with the built-in compensation, to approximately 10^4. The high-frequency part of the apparatus is of the Bloch type. (J.H.M.)

9267 CEA-tr-R-558

VALEURS DU NOMBRE DE MASSE DES ISOTOPES DU GADOLINIUM AVEC UNE PÉRIODE $T_{½}$ = 52 JOURS ET DE L'EUROPIUM AVEC UNE PÉRIODE $T_{½}$ + 4,3 JOURS. (Values of the Mass Numbers of Gadolin Isotope with a Period $T_{½}$ = 52 Days and of Europium Isotope with a Period $T_{½}$ = 4.3 Days.) G. M. Gorodinskii (Gorodinsky), A. N. Murin (Mourine), and V. N. Pokrovskii (Pokrovsky). Translated from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 22, 811-14(1958). 13p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 5022.

9268 IGRL-T/D-88

NUCLEAR PHOTO-EFFECT OF BERYLLIUM. O. Bergmann. Translated by R. S. Forsyth (U.K.A.E.A., Risley) from Acta Phys. Austriaca 4, 338-54(1951). 21p.

The formula for the effective cross section of the (γ,n) reaction on Be^9 is derived and discussed on the basis of the two-body model. If the force range of action of $r = 5 \times 10^{-13}$ cm is assumed in all states, the well depth can be obtained in the ground state up to 12.09 Mev and to 3.3 Mev in the stable final state. (auth)

9269

THE HALF-LIVES OF SOME ELECTRIC QUADRUPOLE TRANSITIONS IN THE LEAD REGION. B. Johansson, T. Alväger, and W. Zuk. Arkiv Fysik 14, 439-49(1959).

Measurements of half-lives of isomeric nuclear states were carried out on electromagnetically isotope separated samples with a 25-channel time analyzer. The 25-channel analyzer made it possible to investigate short-lived mother nuclei. In the cases below the half-lives of the mother nuclei varied from 1.5 h up to 20 h. The following half-lives were obtained: 1383 kev level of Pb^{202m}: $T_{½} = 2.0 \pm 0.15$ mμs, 148 kev level of Tl^{200}: $T_{½} = 7.1 \pm 0.15$ mμs, and 173 kev level of Tl^{198}: $T_{½} = 4.5 \pm 1$ mμs. An upper limit was determined for the 367 kev level of Tl^{199}: $T_{½} \leq 1.5$ mμs and the 330 kev level of Tl^{201}: $T_{½} \leq 1.5$ mμs. In all measurements NaI(Tl) scintillation detectors were used. (auth)

9270

ON MOMENTS OF INERTIA OF STRONGLY DEFORMED ODD-A NUCLEI. Owe Prior (Univ. of Lund). Arkiv Fysik 14, 451-71(1959).

The part of the intrinsic wave functions involving the paired nucleons is less well understood than that associated with the last odd nucleon. At present, one cannot calculate the moment of inertia in more detail (cf. Bohr–Mottelson, 1955). However, if the experimental moment of inertia, associated with the collective rotational motion, of an odd-A nucleus is compared with that of the preceding even-even nucleus of mass number A-1, the difference in moment of inertia may be considered as the isolated contribution of the last odd nucleon whose wave function is more accurately known. Such a systematic difference is experimentally encountered and found to be of the order of 20% of the even-even value. A comparison is made between this experimentally found difference in the moments of inertia and the single particle contribution calculated

on the basis of the wave functions given by S. G. Nilsson (Dan. Mat. Fys. Medd. 29, No. 16, 1955). (auth)

9271

ELECTRON EXCITATION OF COLLECTIVE NUCLEAR TRANSITIONS. L. J. Tassie (Australian National Univ., Canberra). Australian J. Phys. 2, 481-9(1958) Dec.

The inelastic scattering of high-energy electrons with excitation of collective nuclear transitions is treated using a simple hydrodynamical model in which the collective nuclear motion is assumed to be irrotational and incompressible. The effects of nuclear compressibility are discussed. Using the Born approximation, scattering from factors are calculated for several charge distributions for electric quadrupole transitions, and the sensitivity of the scattering to the form of the nuclear charge distribution is examined. (auth)

9272

THE PHOTODISINTEGRATION OF NUCLEI WITH Z BETWEEN 9 AND 30. B. M. Spicer (Univ. of Melbourne). Australian J. Phys. 2, 490-501(1958) Dec.

It is pointed out that the Danos-Okamoto effect (splitting of the giant resonance for non-spherical nuclei into two components) should be more readily observable in the region $9 \leq Z \leq 30$ than in the rare earth region where the initial search for the effect has been made. The ratio of the energies of the two components of the split resonance depends on the deformation of the nucleus from spherical shape. Deformations are even larger in this region of atomic number than for the rare earth nuclei, whose intrinsic electric quadrupole moments are large. The predictions of the theory of Danos (Nuclear Phys. 5: 23, (1958)) are shown to be verified experimentally in five cases. Five other cases where the effect should be observable are discussed. (auth)

9273

EXCITED STATES OF ^{8}Be FROM THE ^{7}Li(d,n)^{8}Be REACTION. R. H. Spear (Univ. of Melbourne). Australian J. Phys. 2, 502-6(1958) Dec.

The energy spectrum of neutrons from the reaction $Li^{7}(d,n)Be^{8}$ at 700 kev bombarding energy has been studied with nuclear emulsions at 0, 75, and 135°. Both resolution and statistics compare favorably with those of previous nuclear emulsion measurements of this spectrum. The results do not confirm the suggestions made by earlier workers that levels at 2.2, 4.1, 5.3, and 7.5 Mev in Be^{8} participate in the reaction, and support the view that the only excited state below 9 Mev in Be^{8} is the well-known broad level at 2.9 Mev. (auth)

9274

DETERMINATION OF THE DIFFUSION AND MODERATOR LENGTH. Andras Adams and György Kosaly. Energia es Atomtech. 11, 665-9(1958). (In Hungarian)

Investigations were made of neutron diffusion lengths in water. The values of diffusion path L_s (E) and moderator path to thermal energy (L_m) were found. (R.V.J.)

9275

FAST NEUTRON CAPTURE IN ^{238}U AND ^{232}Th. R. C. Hanna and B. Rose (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Nuclear Energy 8, 197-205(1959) Jan.

The cross sections for neutron capture in U^{238} and Th^{232} were measured by an activation method for mono-kinetic incident neutrons in the energy range 30 to 1000 kev. (auth)

9276

THE RESONANCE ABSORPTION INTEGRAL OF ^{238}U. Cavid Erginsoy (Middle East Technical Univ., Ankara). J. Nuclear Energy 8, 215-23(1959) Jan.

The resonance absorption integral of infinitely diluted U^{238} is calculated between the first resolved level (6.7 ev) and 1 Mev. The energy-independent parameters Γ_n^0/D and Γ_γ/Γ_n^0 of the average absorption cross section are determined from the region of resolved resonances and the nuclear model theories. The effect of $l > 0$ neutrons is shown to be small but significant. The total value of 277 ± 10 per cent barns is in good agreement with experiment. (auth)

9277

BRANCHING RATIO OF ^{242m}Am DECAY. R. W. Hoff, E. K. Hulet, and M. C. Michel (Univ. of California, Livermore). J. Nuclear Energy 8, 224-8(1959) Jan.

The branching ratio, $\beta^-/EC = 5.1 \pm 0.1$, for Am^{242m} decay was measured by determining the relative amounts of the decay products, Cm^{242} and Pu^{242} formed. The 16 hour Am^{242m} was produced by neutron irradiation of Am^{241} in the Materials Testing Reactor. A pile neutron cross section of 620 ± 65 b for the reaction $Am^{241}(n,\gamma)Am^{242m}$ was measured. (auth)

9278

THE FORMATION OF ^{24}Na AND ^{32}P BY THE INTERACTION OF HIGH ENERGY PROTONS WITH COMPLEX NUCLEI. A. K. Lavrukhina, L. P. Moskaleva, L. D. Krasavina, and I. M. Grechishcheva. J. Nuclear Energy 8, 231-8(1959) Jan.

The formation of Na^{24} and P^{32} by the interaction of high-energy protons with Cu, La, Au, and Th was investigated. The dependence of the yields of Na^{24} and P^{32} on proton energy was studied radiochemically. Yields rise considerably with increase of the proton energy from 120 to 660 Mev and depend markedly on the atomic number of the target element. The calculated formation thresholds for Na^{24} and P^{32} in spallation and fission are compared with the experimental values showing that in Cu, La, and Au these two nuclei are formed mainly by strongly asymmetric fission. Formation of P^{32} from Cu is an exception, being due to spallation, and this process is also important in the formation of Na^{24} from Cu. (auth)

9279

THE ABSOLUTE INTENSITY OF THE 2.5 Mev ^{140}La GAMMA RADIATION. V. A. Arkipov. J. Nuclear Energy 8, 252-3(1959) Jan.

Neutrons from photonuclear reactions in either heavy water or beryllium were slowed down in paraffin. Beta counters were used to determine the beta activity induced by slow neutrons in targets of rhodium or silver. The number of 2.5-Mev gamma rays emitted by La^{140} per second was determined by comparing the photonuclear effects induced in heavy water by samples of La^{140} and RdTh. (A.C.)

9280

THE POLARIZATION OF THE GAMMA-RADIATION FROM THE REACTION ^{30}Si(p,γ)^{31}P. P. M. Tutakin, S. P. Tsytko, A. N. L'vov, A. K. Walter, and V. Iu. Gonchar. J. Nuclear Energy 8, 253-6(1959) Jan.

9281

LEVEL SCHEME OF Re^{187}. Michel Vergnes (College de France, Orsay). J. phys. radium 19, 947-56(1958) Dec. (In French)

The disintegration $W^{187} \rightarrow Re^{187}$ was studied by β

spectrometry, γ spectrometry, and by slow and fast β–γ and γ–γ coincidences. Transitions of 72, 134, 206(?), 480, 552, 630, 686, 775, and 866 kev were found, corresponding to excited levels of 134, 206, 630, 686, 775, 866 (or 1000) kev. The 206 kev level, of period $T_{\frac{1}{2}} = 5 \times 10^{-7}$ sec, is de-excited to the 134 kev level by a 72 kev transition that was identified as E1 (hindrance factor: $F = 3.5\ (\pm 1.5) \times 10^8$.) Spins and parities were assigned for most of the levels. A level scheme based on the experimental results is proposed. (auth)

9282

CONVERSION COEFFICIENT OF THE 87 kev TRANSITION IN ^{160}Dy. M. C. Joshi, B. N. Subba Rao, and B. V. Thosar (Tata Inst. of Fundamental Research, Bombay). Nuovo cimento (10) 10, 775-9(1958) Dec. 1.

The K-conversion coefficient of the 87-kev, E2 transition in Dy^{160} was determined from the photoelectron spectrum and the internal conversion spectrum of Tb^{160} investigated with the intermediate image β-ray spectrometer. α^K is found to be 2.0 ± 0.2, which is large compared with the theoretical value. (auth)

9283

COVARIANT DESCRIPTION OF SPIN. C. B. Van Wyk (Columbia Univ., New York). Nuovo cimento (10) 10, 854-62(1958) Dec. 1.

The most general, finite, proper Lorentz transformation is generated in terms of an infinitesimal transformation. This generator is interpreted as a relativistic spin operator which is capable of describing in a relativistically covariant way the spin and electromagnetic properties of particles with spin $\frac{1}{2}$ and 1 and finite mass. Extensions of the method to particles with vanishing rest mass are indicated. (auth)

9284

ON SOMMERFELD'S APPROXIMATION IN HIGH ENERGY PHOTOELECTRIC EFFECT AND ONE QUANTUM ANNIHILATION OF POSITRONS IN THE K SHELL. H. Banerjee (Indian Inst. of Tech., Kharagpur). Nuovo cimento (10) 10, 863-80(1958) Dec. 1.

The angular distribution and the total cross section for high-energy photoelectric effect and one quantum annihilation of positrons in the K-shell were calculated with the use of the Sommerfeld-Maue approximation for the wave function of the scattering state of the fermion. The error in this procedure is of relative order (a/ξ), where $a = Z/137$ and ξ is the energy of the scattering state in units of mc^2, and is, therefore, negligible in the extreme relativistic case. Results were obtained correctly up to terms of relative order a and methods for calculating the contributions from higher terms are indicated. The expression for the angular distribution of photoelectrons obtained does not show any marked qualitative difference from Sauter's formula. It may be concluded from these results that the ratio of the forward to the maximum intensities of the photoelectrons diminishes as the primary energy is increased. The absorption coefficient for photoelectric effect is presented in a form which is similar to Hall's results. Correction terms in the formulas of Bhabha and Hulme for the positron annihilation process were found to be the same as those in Sauter's formula. (auth)

9285

ON THE CONNECTION BETWEEN THE S-MATRIX AND A CLASS OF NON-LOCAL INTERACTIONS. I. Kh. Chadan (Univ. of Paris). Nuovo cimento (10) 10, 892-908(1958) Dec. 1.

The problem of finding a phenomenological separable interaction from the S-matrix was resolved by M. Gourdin and A. Martin who gave exact and explicit formulas relating the interaction to the phase-shift and bound state binding energy. Their method is generalized to the case where the interaction is the superposition of a non-local separable interaction and a local one, both being central. The local part of the interaction is supposed to be known. It is shown how the separable part can be determined by the S-matrix. Except for a few modifications, the method and results are analogous to those of Gourdin and Martin. The main result is that, given the local part of the interaction, the phase-shift and the bound states binding energies, it is then possible to determine exactly the separable part of the interaction if the phase-shift has a good behavior. (auth)

9286

NEUTRON CROSS-SECTION MEASUREMENTS AT 4.5 Bev. John H. Atkinson, Wilmot N. Hess, Victor Perez-Mendez, and Roger W. Wallace (Univ. of California, Berkeley). Phys. Rev. Letters 2, 168-9(1959) Feb. 15.

The results of a series of measurements on the total and reaction cross sections for 4.5-Bev neutrons on carbon, copper, and lead are reported. The experimental arrangement and counters are illustrated. (W.D.M.)

9287

GENERALIZED DIFFRACTION THEORY FOR VERY-HIGH-ENERGY COLLISIONS. A. E. Glassgold and Kenneth R. Greider (Univ. of California, Berkeley). Phys. Rev. Letters 2, 169-71(1959) Feb. 15.

The most significant feature of the results is that a scattering formalism of sufficient generality for high-energy collisions has been obtained which eliminates the need for any lengthy calculations. Closed-form expressions are thus available to discuss a large number of measurements in terms of a few physically significant parameters. As an example of the method the neutron total and reaction cross sections are considered in the energy range from 0.3 to 4.5 Bev for C, Cu, and Pb. (W.D.M.)

9288

POLARIZATION OF NUCLEONS IN INELASTIC SCATTERING FROM NUCLEI. A. K. Kerman, H. McManus, and R. M. Thaler (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. Letters 2, 172-4(1959) Feb. 15.

The polarization in scattering from a nucleus of spin and isotopic spin zero depends primarily on whether the final state corresponds to "normal" or "abnormal" parity change, and whether it has isotopic spin change 0 to 1. The angular distribution of polarization in these four cases is given for 156 Mev. (W.D.M.)

9289

THE 367 kev RESONANCES IN $^{28}Si(p,\gamma)^{29}P$. K. J. Van Oostrum, J. Alster, N. Hazewindus, and A. H. Wapstra (Technische Hogeschool, Delft, The Netherlands). Physica 24, 1051-4(1958) Dec.

A resonance was found in the gamma-ray yield from the reaction $Si^{28}(p,\gamma)P^{29}$ at $E_p = 367 \pm 2$ kev. The excited level in P^{29} at (3.078 ± 0.009) Mev decays mainly by two cascades via the levels at (1.935 ± 0.020) and (1.380 ± 0.020) Mev to the ground state. (auth)

9290

A DOUBLET RESONANCE IN THE REACTION $^{32}S(p,\gamma)^{33}Cl$. C. Van Der Leun and P. M. Endt (Rijksuniversiteit, Utrecht). Physica 24, 1095-1101 (1958) Dec.

Gamma-ray spectra, yields and angular distributions were measured with scintillation spectrometers at two resonances in the reaction $S^{32}(p,\gamma)Cl^{33}$, at 579.8 ± 1.5 and 587.4 ± 1.5 kev. The 580 kev resonance corresponds to a 2.85 ± 0.02 Mev level in Cl^{33} to which $J = 5/2^+$ is assigned. This level decays almost exclusively to the ground state. The 587 kev resonance corresponds to a 2.86 ± 0.02 Mev level in Cl^{33} with spin $J = 3/2$, which decays with approximately equal intensities to the ground state and to the first excited state at 0.806 ± 0.004 Mev. A Cl^{33} mass excess of −11.244 ± 0.011 Mev results from these experiments. The resonance strengths amount to $\gamma = 4.5 \pm 1.5$ Mev for the 580 kev resonance, and to $\gamma = 26 \pm 10$ Mev for the 587 kev resonance. A search for the conjugate state of the 2.94 Mev level in S^{33}, with $J = 1/2^-$, was unsuccessful. (auth)

9291

THE EVAPORATION THEORY OF PHOTONUCLEAR REACTIONS. J. A. Evans (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 73, 33-9(1959) Jan.

There is considerable disagreement between the predictions of the evaporation (or statistical) theory, and the experimental results for the ratio of emission probabilities of protons and neutrons from a heavy nucleus excited by γ-ray absorption. This investigation deals with refinements which can be made to the evaporation theory; namely, the use of accurate experimental nucleon separation energies, and the assumption of a realistic, diffuse nuclear surface. Penetrabilities are calculated for the nucleus Sn^{118}, assuming a diffuse nuclear surface, and it is found that proton emission is enhanced by a factor of about 4. Finally, the effects of shell structure are discussed in connection with the densities of levels in the residual nuclei. It is found that the theory still predicts far less proton emission than is actually observed. (auth)

9292

THE SMALL ANGLE SCATTERING OF 970 Mev PROTONS BY CARBON. C. J. Batty and W. O. Lock (Univ. of Birmingham, Eng.), and P. V. March (Univ. of Glasgow). Proc. Phys. Soc. (London) 73, 100-9(1959) Jan.

The differential cross section for the scattering of 970 Mev protons by carbon through laboratory angles of 1½° to 5° was measured using nuclear emulsions to detect the scattered particles. The results, showing a sharp rise at small angles due to the onset of Coulomb scattering, were fitted at the larger angles (greater than 2°) in terms of a simple model in which the nucleus is represented by a purely imaginary central potential. Values for the diffraction and total cross sections are derived. Preliminary results of a more detailed analysis, which includes a spin-orbit potential, shows that a fit can be obtained at all angles if a small negative real part to the central potential is included. Further evidence is found for polarization effects at these energies. (auth)

9293

ON THE DISTRIBUTION OF PROTONS IN THE NUCLIDE ^{12}C. L. R. B. Elton (Battersea Coll. of Tech., London) and B. J. Hiley and R. Price (King's Coll., London). Proc. Phys. Soc. (London) 73, 112-14(1959) Jan.

The scattering of high-energy electrons from C^{12} was analyzed for a large variety of possible nuclear form factors and in particular for the density distribution given by the form factor $\rho(\gamma) = \rho_0[1 + (4\gamma^2/3\alpha^2)]$ $\exp[-(\gamma^2/\alpha_0^2)]$, which is based on shell model considerations. (A.C.)

9294

PAIR PRODUCTION IN THE FIELD OF THE ELECTRON. J. Moffatt and G. C. Weeks (Clarendon Lab., Oxford). Proc. Phys. Soc. (London) 73, 114-16(1959) Jan.

Joseph and Rohrlich have recently discussed the theory of pair production and Bremsstrahlung in the field of free and bound electrons. Because of mathematical complexity, no exact calculations of the cross sections for these processes have been made to date. Measurements of the total absorption cross section of liquid hydrogen for 94-Mev photons gave a cross section of 4.7 mb for incoherent pair production, which at 94 Mev should be almost equal to the pair production cross section for a free electron. (A.C.)

9295

SPIN OF ^{103}Ru BY DEUTERON STRIPPING. P. Mason and F. C. Flack (Univ. of Exeter, Eng.) and G. Parry (Univ. of Liverpool). Proc. Phys. Soc. (London) 73, 138-41(1959) Jan.

The ground state of Ru^{103} is predicted by the shell model to have a spin of 7/2 or 5/2 with even parity. Deuteron stripping reactions in Ru^{102} were used in making direct measurements of spins for comparison. The measurements indicate that if the ground state of Ru^{103} is formed by an $l_n = 2$ transition from an even-even nucleus, it must have spin and parity of $3/2^+$ or $5/2^+$. If the transition $l_n = 3$, the spin on parity are $5/2^-$ or $7/2^-$ Proton angular and energy distributions from the $Ru^{102}(d,p)$ reaction are included. (D.E.B.)

9296

LOW ENERGY ELASTIC SCATTERING OF NEUTRONS BY DEUTERONS WITH YUKAWA INTERACTION. F. A. Haas (University Coll., London) and H. H. Robertson (National Physical Lab., Teddington, Middx., Eng.). Proc. Phys. Soc. (London) 73, 160-8(1959) Feb.

Five phase shifts are determined for scattering of neutrons by deuterons in the energy range 0 to 10 Mev. The central type interaction assumed has Yukawa radial dependence, the range and depth of this well being consistent with two-body data. Representation of the deuteron ground state is achieved by means of the Hulthen wave function. The resonating group structure method as applied by Buckingham and Massey (1941) is used to obtain the scattering integro-differential equation which is solved exactly. (auth)

9297

OPTICAL MODEL ANALYSIS OF THE SCATTERING OF 310 Mev PROTONS BY CARBON. C. J. Batty (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 73, 185-92(1959) Feb.

The optical model parameters for the scattering of 310 Mev protons by carbon are obtained in an analysis using the semi-classical approximation. The results are compared with those obtained by other analyses in this energy region. The modification of the Coulomb scattering by the absorption of protons in the nucleus is also considered in some detail. (auth)

9298

INELASTIC SCATTERING OF NEUTRONS BY THORIUM. R. Batchelor and J. H. Towle (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Phys. Soc. (London) 73, 193-200(1959) Feb.

The inelastic scattering of neutrons of up to 1.6 Mev

energy by natural thorium and uranium was studied using the μsec time of flight technique. Scattering was observed to levels in Th^{232} at ~0.05, 0.150 ± 0.015, (0.30 + 0.02), 0.79 (two levels) and 1.09 ± 0.02 Mev. The data obtained for U^{238} are in agreement with previous work. Differential cross sections measured at 90° are also reported. (auth)

9299

THE ELECTRON CAPTURE CROSS SECTIONS FOR PROTONS IN HELIUM. C. A. Haywood (The University, Leicester, Eng.). Proc. Phys. Soc. (London) 73, 201-14(1959) Feb.

The impact parameter formulation of the method of perturbed stationary states is used to calculate the cross section for electron capture by protons in helium. The $\sigma-\sigma$ transition from ground state to ground state is investigated. A one-body formulation is used in which the captured electron moves initially in the combined field of the other electron, the helium nucleus and the incident proton. The presence of the passive electron is allowed for by using as the initial wave function before the collision, an approximation to that calculated from the self-consistent field for the helium atom. During the collision this initial wave function is modified by the introduction of a variational parameter which is determined by a minimization condition for the energy. The possibility of using the one-body formulation for more complex systems is demonstrated by calculations of the electron-capture cross section for protons in argon and neon. (auth)

9300

CROSS SECTIONS FOR (n,p) AND (n,α) REACTIONS WITH 14.5 Mev NEUTRONS. R. F. Coleman, B. E. Hawker, L. P. O'Connor, and J. L. Perkin (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Phys. Soc. (London) 73, 215-20 (1959) Feb.

Activation methods were used to measure 27 (n,p) and 22 (n,α) cross sections at 14.5 Mev for target nuclides in the mass range 100 < A < 250. Radiochemical separations were made in every case. The (n,p) cross sections fell gradually from 10 to 1 mb over the mass range examined. No trend was apparent for the (n,α) cross sections measured, which were all of the order of 0.3 to 3.0 mb. The (n,p) cross sections are in good agreement with the predictions of the direct interaction theory of Brown and Muirhead. (auth)

9301

PHOTODISINTEGRATION OF THE DEUTERON AT 130 Mev. A. F. Nicholson and G. E. Brown (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 73, 221-6(1959) Feb.

The cross section for photodisintegration is calculated assuming the Siegert theorem to be valid. The neutron and proton wave functions are obtained by integrating the Schrödinger equation. Potentials given by Gammel and Thaler are employed in both the ground state of the deuteron and in the final state. Results for the cross section obtained with retardation differ only slightly from those in which it is neglected. Final results for the cross section give a value slightly smaller than the experimental one but do not seem to indicate that a modification in the radiative interaction is necessary. (auth)

9302

NEUTRON SPECTRA AND DIFFERENTIAL CROSS SECTIONS OF THE REACTIONS $^{19}F(\alpha,n)^{22}Na$ AND $^{27}Al(\alpha,n)^{30}P$. R. Batchelor and J. H. Towle (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Phys. Soc. (London) 73, 307-9(1959) Feb.

A time-of-flight spectrometer was used to measure the spectrum of neutrons from the reactions $F^{19}(\alpha,n)Na^{22}$ and $Al^{27}(\alpha,n)P^{30}$. Targets of CaF_2 and Al were bombarded with helium ions at several energies between 3 and 6 Mev. The measured differential cross sections are graphically summarized. (A.C.)

9303

INELASTIC SCATTERING OF HIGH ENERGY NUCLEONS BY COMPLEX NUCLEI. II. EXCITATION OF THE 4.4 Mev LEVEL OF ^{12}C. G. P. McCauley (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) 73, 309-14(1959) Feb.

A previously developed semi-classical formalism (McCauley and Brown, Proc. Phys. Soc. 71, 893(1958)) was applied in studies of the excitation of the first level in C^{12} by 160-Mev protons. The significance of scattered wave distortion by a purely absorptive potential and of spin-orbit considerations in such calculations is discussed. Also considered is the case where the transfer of two angular momentum units has component zero along the beam directions. (D.E.B.)

9304

ANGULAR $\beta-\gamma$-CORRELATION IN THE DECAY OF Ba^{139} AND THE SIGN OF THE RATIO OF THE β-INTERACTION CONSTANTS. N. A. Vlasov and V. P. Rudakov. Zhur. Eksptl'. i Teoret. Fiz. 36, 24-7(1959) Jan. (In Russian)

The differential angular $\beta-\gamma$-correlation was measured for the cascade E_β = 2.23 Mev and E_γ = 0.163 Mev in the decay of Ba^{139}. The anisotropy coefficient for total β-particle energies of 4 mc^2 was found to equal $a = +0.058 \pm 0.023$. The result is compared with that obtained by calculations performed on basis of the single-particle model. The theoretical result agrees with experiment only for negative values of the ratio g_V/g_A. (tr-auth)

9305

Cd^{146} AND Eu^{146} CONVERSION ELECTRON SPECTRA. N. M. Antoneva, A. A. Bashilov, B. S. Dzhelepov, and B. K. Preobrazhenskii (Leningrad State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 28-31(1959) Jan. (In Russian)

The conversion electron spectra of the neutron-deficient isotopes Gd^{146} and Eu^{146} were investigated. Conversion electrons corresponding to three nuclear transitions with energies of 114.8, 115.5, and 155 kev were observed in the case of Gd^{146} and to two transitions with energies of 630 and 742 kev in the case of Eu^{146}. Decay schemes are proposed. (tr-auth)

9306

SCATTERING OF μ-MESONS IN LEAD. A. I. Alikhanyan and F. R. Arutyuyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 32-40(1959) Jan. (In Russian)

The scattering of μ mesons possessing momenta between 1.0 and 1.8×10^8 ev was studied in 7 mm thick lead plates. The experimental angular distribution is compared with the theoretical multiple scattering curve which takes into account the finite nuclear dimensions. It is shown that after introduction of all relevant corrections the experimental results satisfactorily agree with the calculations. (tr-auth)

9307

INVESTIGATION OF STRIPPING REACTIONS OF THE (d,p) TYPE IN SILICON ISOTOPES. V. G. Sukharevskii

(Inst. of Nuclear Physics, Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 52-9(1959) Jan. (In Russian)

The angular distributions of protons from the reactions $Si^{29,30}(d,p)Si^{30,31}$ were measured with nuclear emulsions for the ground and first excited states at deuteron energies of 4.3 Mev. The orbital angular momenta in the captured neutrons, the absolute values of the differential cross sections of the reactions and the reduced neutron level widths in the final nuclei were determined. The experimental proton angular distributions are compared with the theoretical curves of Butler and Bhatia. The spins and parities of the ground and first excited states of Si^{31} confirm the calculations of Goldhammer. (tr-auth)

9308

ENERGY SPECTRA OF α-PARTICLES EMITTED FROM THE LONG LIVED ISOTOPES Th^{232} AND U^{238}. G. E. Kocharov, A. P. Komar, and G. A. Korolev (Leningrad Inst. of Physics and Tech.). Zhur. Eksptl'. i Teoret. Fiz. 36, 68-73(1959) Jan. (In Russian)

The α spectra of Th^{232} and U^{238} were investigated by means of an ionization chamber with a grid. The energies and intensities of the transitions to the 2^+ and 4^+ levels of the daughter nuclei were determined. (tr-auth)

9309

β-γ-CORRELATION IN FIRST FORBIDDEN β-TRANSITIONS. Yu. V. Gaponov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 193-203(1959) Jan. (In Russian)

A general formula was obtained for the $\beta-\gamma$-correlation of β-decay electrons and circularly polarized γ-quanta emitted by the excited nucleus formed after β-decay. The formula is valid for first forbidden β transitions. The calculation is performed for an arbitrary mixture of β coupling, account being made on the nuclear coulomb field and in particular of the so-called "coulomb" terms. Two particular cases are considered -that of unique and of coulomb β transitions. (tr-auth)

9310

ON γ-VIBRATIONS OF THE ATOMIC NUCLEUS SURFACE. A. S. Davydov and D. A. Zaikin (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 233-7(1959) Jan. (In Russian)

The energy and probability of excitation of γ vibrations of the surface of an atomic nucleus are computed on the basis of the shell model, an anisotropic harmonic oscillator potential being assumed. It is shown that in order of magnitude the energy of the first excited state of this type is close to that of single nucleon excitations and that the probability of excitation of these states is much smaller than the probability of excitation of rotational states in the nucleus. (tr-auth)

9311

DISRUPTION OF A CHARGED LIQUID DROP AND NUCLEAR FISSION. B. T. Geilikman (Moscow State Pedagogical Inst.). Zhur. Eksptl'. i Teoret. Fiz. 36, 249-52(1959) Jan. (In Russian)

Disruption of a charged liquid drop is considered. The vibrational energies of the parts of the drop are computed and also the energy of their relative motion. The general results thus obtained are applied to fission of nuclei. (tr-auth)

9312

CONTRIBUTION TO THE THEORY OF MULTIPLE SCATTERING. M. L. Ter-Mikaelyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 36, 253-7(1959) Jan. (In Russian)

A method for calculation of the multiple scattering curves with account of the finite nuclear dimensions is presented. Experimental results on scattering of fast electrons by nuclei are used in the calculations. (tr-auth)

9313

ABSORPTION OF POLARIZED μ-MESONS BY NUCLEI. NEUTRON POLARIZATION. L. D. Blokhinzev (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 258-63 (1959) Jan. (In Russian)

Formulas are derived for the polarization of neutrons produced as a result of absorption of polarized μ^- mesons by nuclei. Estimations for the O^{16} and Ca^{40} nuclei are presented. (tr-auth)

9314

ENERGY SPECTRUM OF U^{238} PHOTOFISSION FRAGMENTS. B. S. Kovrigin, M. Ya. Kondrat'ko, and K. A. Petrzhak (Leningrad Inst. of Tech.). Zhur. Eksptl'. i Teoret. Fiz. 36, 315-17(1959) Jan. (In Russian)

The energy spectrum of fragments from U^{238} photofission produced by 12.5-Mev photons is given and compared to that from the thermal neutron fission of U^{235}. (R.V.J.)

9315

β-SPECTRA OF F^{20} AND F^{17}. S. S. Vasil'ev and L. Ya. Shavtvalov. Zhur. Eksptl'. i Teoret. Fiz. 36, 317-18 (1959) Jan. (In Russian)

Investigations of the F^{20} β spectrum were made with a magnetic lens β spectrometer by bombarding a LiF target (≈ 0.4 mg/cm^2) with 4-Mev deuterons. The F^{20} β spectrum was obtained by substracting the Li^8 β spectrum from the combined F^{20} and Li^8 spectra. The Fermi graph for F^{20} was a straight line. The F^{20} upper boundary was (5.45 ± 0.05) Mev. The ratio of the cross sections of $\sigma(F^{19})/\sigma(Li^7)$ was determined from the curves of Li^8 and F^{20} to be ~ 1.5. The spectrum for F^{17} was obtained for the reaction $O^{16}(d,n)F^{17}$. (R.V.J.)

9316

K EMISSION OF FISSION FRAGMENTS AND DISTRIBUTION OF FRAGMENTS BY CHARGES. V. V. Sklyarevskii, E. P. Stepanov, and B. A. Medvedev. Zhur. Eksptl'. i Teoret. Fiz. 36, 326-8(1959) Jan. (In Russian)

It was found previously that the U^{235} fission γ spectrum line at 30 kev is nonmonochromatic, and an assumption was made that the line expresses x-ray K-emission by heavy fission fragments with variable Z. Results are presented of U^{235} soft x-ray spectrum measurements made to evaluate the distribution widths of light and heavy fragments according to charge. The spectrum of the U^{235} fission γ rays at 10 to 50 kev was analyzed. (R.V.J.)

9317

ON TRANSITIONS AT 100 kev IN Ce^{144} SPECTRUM. A. V. Gnedich, L. N. Kryukova, and V. V. Murav'eva (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 329(1959) Jan. (In Russian)

The Ce^{144} conversion spectrum was studied with a spiral, 0.25% resolving power β spectrometer. A diagram of the conversion line at 57.7 kev is presented showing two components with energies of 57.76 and 57.45 kev, in good agreement with the magnitudes K-100 and M-59. Also, the Line L_1-100, $E_e = 92.83$ kev was found. According to the obtained data the 100-kev transition energy is (99.7 ± 0.1) kev. In rela-

tion to the area under the K and L_1 lines, the conversion ratio coefficient for $\alpha_K/\alpha_{L_1} = 3.3 \pm 0.8$. The contribution M-95 was evaluated. The value for the conversion coefficient corresponds to transition M-3. (R.V.J.)

9318

ON THE Ce^{144} DECAY SCHEME. N. V. Farafontov and A. A. Sorokin (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 330-1(1959) Jan. (In Russian)

The $\gamma-\gamma$ and $e^-\gamma$ coincidences were measured in order to verify the decay scheme of Ce^{144}. (R.V.J.)

9319

DECAY OF BERYLLIUM HYPERFRAGMENT. A. O. Vaisenberg and V. S. Smirnitskii. Zhur. Eksptl'. i Teoret. Fiz. 36, 333-5(1959) Jan. (In Russian)

The non-mesonic decay of beryllium hyperfragment, found in Ilford G-5 emulsion exposed at ~25 km elevation, permitted a relatively accurate measurement of the Λ^0-particle bond. The primary star 12 + 4p emits a slow hyperfragment which stops in the same layer, forming a secondary triple-prong star. The hyperfragment path is 60μ. The charge, obtained by comparison of the hyperfragment track thickness with the thicknesses of Be^8 and α particle tracks was equal to $Z \approx 4$. The total energy of particles 1, 2, and 3 was 345.7 ± 2 Mev. By assuming that an equal and counter-directional energy was carried away by a neutron, the decay scheme was found to be: $\Lambda^0\ Be^8 \rightarrow He^4 + d + p + n + Q$, Q = (160.0 ± 1.3) Mev. The Λ^0 bond energy is B_{Λ^0} = (8.2 ± 1.6) Mev. (R.V.J.)

9320

ON THE DOUBLE β DECAY PROBABILITIES. F. Yanoukh (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 335-7(1959) Jan. (In Russian)

The negative results obtained in a search for binary β decay indicate that the neutrino is not a Majorana particle and that experimental precision is not sufficient for finding double β decay with the Dirac neutrino. Considering the new situation in the theory of β decay, it is possible to attempt a theoretical analysis of double β decay probability using the effects of nonconservation of parity and nonconservation of lepton charge. The latter is quite improbable; however, it cannot be completely ignored. The Hamiltonian of β interaction with nonconservation of parity and lepton charge evolved by Pauli was used by C. Enz (Nuovo cimento 6, 250(1957)) to express a generalized equation for double β-decay probability. The generalization was analyzed, and the probability of double β decay in the transition scheme $0^+ \rightarrow 1^- \rightarrow 0^+$ was calculated. The obtained expression for half decay time is given. Considering the first forbidden transition ft ~10^7 and $[C_S/C_A] = 0.1$ or $C_T/C_V = 0.1$, a $T_{1/2} \leq 2 \times 10^{22}$ years is obtained for Ca^{48}. (R.V.J.)

9321

EXPERIMENTS ON NUCLIDES DECAYING BY POSITRON EMISSION AND ELECTRON CAPTURE. Joseph Konijn. Thesis, Technische Hogeschool Te Delft, Netherlands, 1958.

The experimental equipment used in this investigation of radioactive decay is described. Important aspects of beta decay theory which are investigated in the experimental parts of this thesis are discussed. Experiments on the decay of Mn^{52} are described. Investigations into the decays of Ni^{57} and Y^{88} are discussed in detail. A description of an investigation on electron capture to positron emission branching ratios is given. Measurements carried out for allowed transitions on the decays of Na^{22}, Sc^{44}, V^{48}, Mn^{52}, Co^{58}, and Ni^{57} and for first forbidden transitions on Rb^{84} are discussed. (W.D.M.)

Theory

9322

TRANSPORT COEFFICIENTS DETERMINED USING THE SHIELDED COULOMB POTENTIAL. Richard L. Liboff (New York Univ.). Phys. of Fluids 2, 40-6(1958) Jan.-Feb.

In the classical Chapman-Enskog theory of a fully ionized gas, the transport coefficients evolve as functionals of certain weighted total scattering cross sections. If a Coulomb potential is assumed between scattering particles, these scattering integrals diverge. A common procedure to circumvent this difficulty is to integrate the Coulomb results up to the Debye cutoff. A more appropriate procedure involves the use of the shielded Coulomb potential, in which case the scattering integrals converge, and there is no need to introduce a cutoff. These integrals are calculated using the shielded Coulomb potential and the resultant transport coefficients are compared with those of the standard "Coulomb plus Debye cutoff" calculations. To the "dominant log term" the two procedures give identical results. To terms of the next order of accuracy for the viscosity and thermal conductivity the difference between the two formulations is of the order of 0.5%, and for the diffusion and electrical conductivity the difference is of the order of 2%. The major calculation is that of the classical cross section for the screened Coulomb potential. (auth)

9323

THE RESONANT SCATTERING INTEGRAL; APPLICATION TO THE ANALYSIS OF ELASTIC PROTON SCATTERING. Philip B. Smith (Rijksuniversiteit, Utrecht). Physica 24, 1085-91(1958) Dec.

A relationship is presented which permits a determination of the quantity Γ_p^2/Γ, where Γ_p and Γ are the particle (proton) and total widths, respectively, of an isolated resonance of which the total spin and channel spin mixing parameter are known. The analysis depends upon observation at a zero of the relevant Legendre polynomial, and hence only resonances for which $l \neq 0$ can be analyzed. Since the relationship is independent of instrumental resolution, it can be expected to yield better values of the parameters than the usual curve fitting procedure. The results are independent of target thickness, counter efficiency and solid angle, and current integrator precision. The formula given is valid if there is no appreciable l-mixing, no overlap of resonances, and if the "hard-sphere" correction to the Rutherford scattering is negligible. Tables are given showing where the latter approximation may be expected to break down. The restriction on l-mixing can be removed if the parity allowed l's are odd, since observation at 90° (C.M.) makes all interference terms vanish. If the allowed l's are even it is still possible to apply the formula given if an angle of observation can be found where the interference terms vanish. In both cases difficulty will be encountered in evaluating the results since the l-mixing parameter must be known. It is also shown that if the off-resonant scattering can be quantitatively compared to the Rutherford scattering, the range of application of the formula can be extended to cover all well-separated resonances. The extended formula depends, however, on the constancy (not the absolute value) of target thickness, counter efficiency

and solid angle, and current integrator calibration. The analysis is applied to published data on the elastic scattering at a bombarding energy of 1.286 Mev in the $Na^{23}(p,p)$ reaction. (auth)

9324
QUANTIZATION OF FIELDS OF ZERO MASS. II. FERMION FIELDS. C. G. Bollino. Publs. com. nacl. energia atomica (Buenos Aires) Informe No. 2, 1-13 (1958). (In Spanish)

9325
LAWS OF CONSERVATION OF ANGULAR MOMENTUM AND PARITY IN THE STATISTICAL THEORY OF MULTIPLE PRODUCTION. V. B. Magalinskii (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 93-7 (1959) Jan. (In Russian)

The general statistical method of microcanonical distribution is employed to compute the statistical weights of a many-particle system obeying an arbitrary statistics, account being made for the laws of conservation of total angular momentum and parity. A general computational formula was obtained under the assumption that all particles obey the Boltzmann statistics. (tr-auth)

9326
GENEALOGICAL COEFFICIENTS IN THE GENERALIZED NUCLEAR MODEL. V. G. Neudachin and Yu. F. Smirnov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 36, 186-92(1959) Jan. (In Russian)

The construction of a wave function of a system of n nucleons with prescribed values of the isobaric spin T from the wave functions of individual states N_1, $N_2 \ldots N_n$ not coupled vectorially is considered. The number of independent states with a given T is determined by algebraic methods. The problem is primarily of interest in relation to the unified model of light nuclei. (tr-auth)

9327
SUPERFLUIDITY CONDITION OF AN ATOMIC NUCLEUS AND THE PHASE TRANSITION TEMPERATURE. V. G. Solov'ev (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 36, 293-4(1959) Jan. (In Russian)

The conditions for appearance of a superfluid state in an atomic nucleus are derived with the help of a variational principle proposed by N. N. Bogolyubov. The superfluidity condition reduces to the requirement of predominance of attraction forces between protons located in the same shell at an energy equal to the Fermi energy. If at zero temperature the nucleus is in a superfluid state a transition from the superfluid to normal phase will take place with increase of the temperature. The critical temperature of the transition was determined. (tr-auth)

RADIATION EFFECTS ON MATERIALS

Refer also to abstracts 9445 and 9448.

9328 57-GL-255
General Electric Co. General Engineering Lab., Schenectady, N. Y.
THE EFFECTS OF REACTOR RADIATION ON GERMANIUM AND SILICON DIODES. J. W. Thorson. July 1957. 54p.

The effects of reactor radiation on seven types of crystal diodes were investigated. Irradiations for times ranging from 30 seconds to 2 hours were carried out in a fast neutron flux of 10^{11} nv. Data are presented in the form of oscillograms. (auth)

9329 AD-105663
Motorola Inc. Riverside Research Lab., Riverside, Calif.
HANDBOOK OF NUCLEAR RADIATION EFFECTS. PART 2. Preliminary Status Report. Apr. 1956. 78p. Project Nos. 5-(5-5042)-50578 and 5-(1-125A). Contract AF33(600)-31313.

A brief examination of radiation effects on the materials and electronic processes involved in the design and operation of electronic equipment is presented. The radiation intensity used as a reference was 10^6 n/cm^2 sec, applied in 40-hour increments for a total irradiation time of 5000 hours. The data were compiled for use in designing electronic equipment for use in a nuclear powered aircraft. (W.D.M.)

9330 AD-134855
Stevens Inst. of Tech., Hoboken, N. J.
LITERATURE SURVEY ON THE EFFECTS OF RADIATION TO ELECTRON TUBE MATERIALS. Semi-annual Report for the Period February 1, 1957–May 31, 1957. Everett R. Johnson. 30p. DA Project No. 3-99-13-000.

The components used in the manufacture of electron tubes were determined by interviewing three leading tube manufacturers. The unclassified literature covering radiation damage to metals, alloys, ceramics, minerals, and organics was abstracted. It has been found that little or no damage to pure metals should appear from exposures up to 10^{20} nvt. Some alloys and metals show an increase in the brittle-ductile transition temperature which will affect impact strength. The data on ceramics which is pertinent to this study is meager. Calculations are made on the amount of radioactivity induced by exposing 1 gram of material to a flux of 10^{16} neutrons cm^{-2}, for 300 seconds. The results indicate a cooling period of 1 month for safe handling. Special reference to glass and glass-to-metal seals is made. 62 references. (auth)

9331 AD-156976
National Bureau of Standards, Washington, D. C.
RADIATION CHEMISTRY OF MONOMERS AND POLYMERS. Progress Report [for] November 1, 1957 to January 31, 1958. L. A. Wall. Feb. 28, 1957. 11p. Project No. 7-(8-7360). Contract AF33(616)57-14.

An investigation was made of the chemical changes that take place in fluorocarbon monomers and polymers when subjected to ionizing radiation and in this way elucidate the mechanism and kinetics of such changes. (J.E.D.)

9332 AD-201416
Netherlands. Technisch Documentatie Centrum voor de Krijgsmacht, Hague.
INVLOED VAN RADIOACTIEVE STRALING OP MATERIALEN. (Effect of Radioactive Radiation on Materials.) J. van Galen, ed. June 10, 1958. 48p. (TDCK-13939).

A survey is presented on the changes in properties caused by radiation. The physical background of radiation damage is briefly discussed, and radiation effects are illustrated with lattice faults in crystals. A description of the various radiation effects, the various kinds of radiation, and their effects on a number of materials is given. Abstracts are presented of articles dealing with radiation effects on metals, reactor mate-

rials, chemical compounds, electrical components, semiconductors, and photographic materials. (J.S.R.)

9333 AECU-4018

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

NEUTRON IRRADIATION EFFECTS IN A COPPER–ALUMINUM ALLOY. C. R. Houska and B. L. Averbach. [1958?]. 27p. $4.80(ph), $2.70(mf) OTS.

Diffuse x-ray scattering and peak intensities were measured for a polycrystalline alloy of copper–14.5 at. % aluminum before and after irradiation. It was shown that the average short range order configuration in the first five neighboring shells was somewhat enhanced as a result of the irradiation. In addition, a temperature independent rise was observed in the diffuse scattering. This was interpreted in terms of static atomic displacements arising from the localized volume changes associated with neutron damage. The absence of line broadening or significant line shifts after irradiation is further confirmation of the localized nature of the damage. Defect models of radiation damage involving short range effects which average out over larger distances in the lattice are discussed. (auth)

9334 AERE-C/M-372

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE RELEASE OF FISSION PRODUCT RARE GAS FROM A URANIUM–ZIRCONIUM ALLOY DURING IRRADIATION IN THE BEPO REACTOR. F. J. Stubbs and C. B. Webster. Feb. 1959. 13p.

The release of fission product gases from a 5% highly enriched uranium–zirconium alloy during neutron irradiation is independent of temperature up to 600°C. The release rate is small and can be attributed to fission recoil from the surface of the gas atoms or their precursors. Above 600°C the release rate increases sharply and becomes highly temperature dependent. At the high temperature the emission is attributed to a diffusion process in addition to recoil and over the range 700 to 900°C diffusion coefficients have been calculated. The activation energy for diffusion over this temperature range is about 23 K cal/mole. (auth)

9335 AERE-GP/M-178

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

DIFFRACTION DATA FROM RADIOACTIVE MATERIALS. R. S. Pease. June 1, 1955. Decl. Jan. 26, 1959. 11p.

Various techniques are examined by which diffraction data could be obtained from highly active materials, particularly irradiated fuel element specimens. Modifications to standard x-ray powder techniques are described by which preliminary data have been obtained on fuel element specimens irradiated to 0.4% burn-up. These data suggest that most of the macroscopically observed density decrease in metal samples is due to the formation of low density regions between crystallites. (auth)

9336 FZM-1153

Convair, Fort Worth, Tex.

THE CONVAIR RADIATION EFFECTS TESTING SYSTEM. J. W. Allen. [1958]. 12p.

Paper presented at the Third Semiannual Radiation Effects Symposium at Marietta, Ga., October 28-30, 1958.

The radiation effects testing system at Convair-Fort Worth, including the shuttle system to transport specimens in special environmental chambers is described. The hardware and controls necessary to meet the environmental criteria and the versatility of the system are discussed. With this system, materials, components, aircraft subsystems, and other assemblies can be irradiated in various imposed environments. These assemblies can be operated and data obtained while being irradiated. (W.D.M.)

9337 HW-57900(Rev.)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

HIGH TEMPERATURE RADIATION INDUCED GRAPHITE CONTRACTION. J. M. Davidson, E. M. Woodruff, and H. H. Yoshikawa. Feb. 2, 1959. 14p. Contract W-31-109-Eng-52. $3.30(ph), $2.40(mf) OTS.

Information concerning graphite contraction applicable to high-temperature, graphite-moderatored reactors is presented. The scope includes relevant data from all available sources, interpretation and extrapolations as can reasonably be made, and a discussion of the effects observed in terms of current radiation damage theory. Limits of accuracy and a discussion of experimental techniques are presented. (auth)

9338 IGR-TN/W-933

United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.

THE SWELLING OF 0.17% BURN-UP URANIUM ON POSTIRRADIATION ANNEALING. D. Rhodes and V. W. Eldred. 1958. 18p.

Post irradiation annealing of 0.17% burn-up uranium gave a density decrease of 0.1% on heating at 610°C for periods up to 140 hours. On heating at 710°C, a 1% decrease was observed for periods up to 100 hours. After an initial density change, no progressive change with time was detected at either temperature over these annealing periods. On heating at 880°C the observed density change was found to be markedly time dependent and varied in a nonlinear manner up to 60 hours. For periods greater than this the density did not decrease beyond about 30%. An attempt has been made to interpret these results in terms of the observed microstructural changes. (auth)

9339 MRL-36

Watertown Arsenal. Materials Research Lab., Mass.

THE USE OF NUCLEAR MAGNETIC RESONANCE FOR RADIATION EFFECT STUDIES. P. Sagalyn. July 1958. 12p. Contract DA-5-93-32-001.

Damage produced in a crystal lattice by radiation can produce changes in the electrical and magnetic environment of the atomic nucleus. These changes can sometimes be detected by their effect on the nuclear magnetic resonance signal. This method of studying radiation damage is discussed with particular reference to nuclear electric quadrupole effects in metals. (auth)

9340 NARF-59-8T

Convair, Fort Worth, Tex.

EFFECTS OF IRRADIATION ON PLASTIC LAMINATES. R. R. Bauerlein. Feb. 26, 1959. 16p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-225).

Twelve kinds of laminates commonly used in modern aircraft construction were tested to determine their usefulness in a nuclear-powered aircraft. Of these 12, six were impregnated with phenolic resin, four with epoxy resin, and two with polyester resin. All test specimens were subjected to six types of tests. Static irradiation at

ambient temperature by fluxes as great as 9.3×10^9 ergs/g(C) combined with 1.2×10^{15} fast neutrons/cm^2 did not affect the mechanical and physical properties of the laminates. The laminates discussed in this report that meet qualified design criteria for nonnuclear aircraft are suitable for similar applications in nuclear aircraft, provided the exposure does not exceed the above values. (auth)

9341 RDB(W)/TN-90

Gt. Brit. Windscale Works, Sellafield, Cumb., England.

A REVIEW OF THE WORK CARRIED OUT AT WINDSCALE TO AUGUST 1, 1953, ON THE WIGNER ENERGY IN GRAPHITE. J. C. Bell. Sept. 1953. 16p. (WTSC/R-85).

A review is given of the work carried out at Windscale to August 1st, 1953, on the energy content of the graphite of the Windscale piles. The apparatus used for the measurement of the energy content is described, and the results obtained are given. A new system of measurement which is being developed is also described. Recommendations for the procedure in future measurements are made. (auth)

9342

EFFECT OF HIGH INTENSITY RADIATION ON ELECTRONIC PARTS AND MATERIALS. C. P. Lascaro and A. L. Long. Elec. Mf. 119-21, 306(1958) Sept.

The results of a study of the effect of neutron and gamma radiation on electronic components used in communication equipment are reported. (auth)

9343

RADIATION EFFECTS ON THE MECHANICAL AND PHYSICAL PROPERTIES OF ROCKS. R. Kvaril. Jaderna Energie 5, 11-13(1959). (In Czech.)

The effects of irradiation on the mechanical and physical properties of natural rocks were analyzed. (R.V.J.)

9344

THERMAL AND RADIATION ANNEALING OF Ge. J. W. MacKay, E. E. Klontz, and G. W. Gobeli (Purdue Univ., Lafayette, Ind.). Phys. Rev. Letters 2, 146-8(1959) Feb. 15.

It was found that about 50% of the defects produced by 1.10-Mev electron irradiation of Ge at temperatures near 10°K can be annealed either by heating to 80°K or by irradiating with electrons of energy less than the threshold for damage. Nearly degenerate single crystals of n-type Ge ($N_0 = 7 \times 10^{17}$/cm^3) were used in the investigation. The Hall coefficient and conductivity were measured as a function of irradiation. (W.D.M.)

9345

ANALYSIS OF THE SOLUBILITY BEHAVIOUR OF IRRADIATED POLYETHYLENE AND OTHER POLYMERS. A. Charlesby (Royal Military Coll. of Science, Shrivenham, Berks, Eng.) and S. H. Pinner (Tube Investments Research Labs., Hinxton Hall, Eng.). Proc. Roy. Soc. (London) A249, 367-86(1959) Jan. 13.

The equation for the sol fraction (s) of a cross-linked polymer network becomes readily tractable when applied to special cases of the generalized distribution function $n(u) = C(u/u_1)^{\lambda-1} \exp(-\lambda u/u_1)$. For values of $\lambda = \infty$, 1, and 0, respectively, this function yields the uniform distribution, the exponential distribution, and a hypothetical pseudo-random distribution. Assuming that cross-linking and fracture occur at random and in proportion to the radiation dose, simple expressions are derived relating sol fraction to radiation dose (r) for each of the three distributions. The most useful of these is the relation involving the fracture density per unit dose (p_0) and the density of cross-linked units per unit dose (q_0). $s + \sqrt{s} = p_0/q_0 + 1/q_0 u_1 r$. This holds strictly for exponential distributions, whether or not main-chain fracture occurs simultaneously with cross-linking, and also holds at high doses for the other distributions considered, providing that cross-linking is accompanied by fracture. This treatment is applied to experimental results on low-density and high-density polyethylenes, polyvinyl acetates, polyvinyl chloride, polypropylene, and polyalkyl acrylates. The relevant radiation parameters p_0, q_0 and the corresponding G values are deduced. It is found, in the case of polyethylene, that q_0 is, within experimental error, independent of the molecular weight, degree of branching or crystallinity, but is affected by the presence of air. Similar values of q_0 are also observed for polyvinyl acetate and polyvinyl chloride. (auth)

RADIOACTIVE WASTE

Refer also to abstracts 8741, 8742, 8743, and 8744.

9346 CF-59-1-77

Oak Ridge National Lab., Tenn.

REDUCTION OF RADIOACTIVE WASTE TO SOLIDS FOR ULTIMATE STORAGE. C. W. Hancher. Jan. 28, 1959. 19p. Contract [W-7405-eng-26]. $3.30(ph), $2.40(mf) OTS.

For presentation at the American Chemical Society's Nuclear Technology Symposium, Boston, Apr. 5-10, 1959.

A procedure is presented for processing high-level radioactive wastes. The steps include pot calcination of acid and neutral waste, followed by separation by distillation of the fission products from effluent liquid and gaseous streams. The fission products are recycled to the calcination pot. After calcination, the pot contents are stored in a controlled area for cooling and accountability. (auth)

9347 NP-7248

Brussels. Centre d'Etude de l'Energie Nucléaire.

AFVALWATERBEHANDELING. DRIEMAANDELIJKS VORDERINGSVERSLAG. (Treatment of Waste Solutions. Tri-Monthly Progress Report.) P. Dejonghe, L. Baetsle, L. De Witte, G. Mosselmans, H. Spriet, and N. Van de Voorde. Aug. 11, 1958. 32p.

A progress report on the processing of waste solutions at the Centre d'Étude de l'Énergie Nucléaire is presented. The topics discussed include operation of waste treatment installations, investigations of lignite as an ion exchanger, decontamination work, and special studies on the expansion of the present waste installation and waste product treatment by the water purification station of the BR-2 and BR-3. (J.S.R.)

9348 ORO-185

Texas. Agricultural and Mechanical Coll., College Station.

A STUDY OF SOME FACTORS INVOLVED IN THE DISPOSAL OF RADIOACTIVE WASTES AT SEA. Annual Progress Report. Richard G. Bader. Feb. 1957. 81p. Contract AT(40-1)-2061. $13.80(ph), $4.80(mf) OTS.

During the first year of this research project a literature survey involving the compilation of published and unpublished data on the physical oceanography, meteorology, and geological oceanography of the Mississippi

Delta was conducted. Additional data and samples were collected on four cruises to the Mississippi Delta area totalling thirty seven days at sea. The field program was devoted to the collection of bottom sediment samples, suspended sediments, salinity and temperature measurements, and plankton tows. In addition, current, meteorologic, and turbid water observations, as well as bathymetric runs were made during the cruises. A SCUBA diving program was also started for the purpose of placing marked stakes on the bottom for use in sediment investigations. The analysis of the cruise data covering the physical oceanography of the delta region is now being completed. Some of it has been presented in this report. The sediments were collected by means of coring tubes and surface samplers. They are now in the process of preparation and analysis. Mechanical analysis is being conducted in order to delineate the sediment types of the south and western Delta. A clay mineral analysis of bottom deposits and suspended sediments has begun, using differential thermal analysis, cation exchange determinations, and x-ray-diffraction techniques. (auth)

9349 ORO-186(Pts. I-V)

Texas. Agricultural and Mechanical Coll., College Station.

A STUDY OF SOME FACTORS INVOLVED IN THE DISPOSAL OF RADIOACTIVE WASTES AT SEA. PART I. GENERAL PROJECT INFORMATION. PART II. PHYSICAL OCEANOGRAPHY AND SEDIMENTOLOGY. PART III. MARINE BIOLOGY. PART IV. CLAY MINERALOGY. PART V. PHYSICO-CHEMICAL CONSIDERATIONS. Annual Report. Feb. 1958. (Pts. I and II, 104p.; Pts. III, 83p.; and Pts. IV and V, 60p.). Project 142. Contract AT(40-1)-2061. (Pts. I and II, $16.80 (ph), $5.70(mf) OTS; Pt. III, $13.80(ph), $4.80(mf) OTS; and Pts. IV and V, $9.30(ph), $3.60(mf) OTS.

These five parts were issued in three books, but are cataloged as a unit.

The Mississippi River in the vicinity of the South and Southwest Pass and the adjacent water of the Gulf of Mexico were investigated. The gross categories into which the investigation was divided include physical, physico-chemical, and biological aspects. Field operations, including sampling cruises, are briefly described in the first part as well as personnel qualifications and disposal conferences attended. As a starting point in the evaluation of physical factors involved, data were obtained from U. S. Corps of Engineers. The physical and sedimentary environment of the west Mississippi Delta area may be divided into three sub-environments such as the fresh water regime within the river channel influenced principally by river discharge and tides, the fresh-saline water regime in the vicinity of the mouth of the Pass affected by river discharge and other factors, and the saline water regime of the open Gulf influenced by the prevailing winds and currents. In view of the importance of clay minerals in the process of chemosorption with respect to radioactive materials, their distribution in the bottom deposits of the western Mississippi Delta area was investigated. The most abundant clay mineral in the area is montmorillonite which makes up about 50% of the clay mineral suite. Illite and kaolinite compose about 25% each. The abundance of montmorillonite is significant since it has the greatest number of exchangeable postions and the greatest capacity for adsorbing organic complexes. The physico-chemical characteristics of the clays and other suspended materials in the water include exchange capacity and adsorption and the differential flocculation potential of the various clay minerals. The suspended sediment load in the lower Mississippi River, which consists of an appreciable amount of clay minerals is of such a magnitude that the accumulation of radioactive ions may be appreciable. The salinity of the water and the extent of the salt water wedge in the river as well as the extent of the turbid mass in the Gulf of Mexico must be considered in the problem of localization of any radioactive contamination. The exchange capacity of the clays are effected by the organic material present. In the marine environment there appears to be a blocking effect which is not readily observed in the river environment. The organic material which is in turn adsorbed on clays is capable of complexing ions and thus accomplish chemical scavenging. An evaluation of the biological accumulation, a study of the copepod fauna, was undertaken in the Mississippi Delta region in 1956. Samples were collected in the spring, summer, fall, and early winter. The work was conducted mainly from off the South Pass to about 30 miles offshore. The pattern of distribution of the number of species seems to be associated with the salinity conditions of the area, for in the fall and winter when the salinities increased near the delta many offshore and oceanic species advanced into the region. The seasonal abundance of the copepods varied from rich in the summer to poor in the winter; in the fall they appeared to be more abundant and more varied than in the spring. (For preceding period see ORO-185.) (J.R.D.)

9350 ORO-187

Texas. Agricultural and Mechanical Coll., College Station.

THE CLAY MINERALOGY OF THE BOTTOM DEPOSITS OF THE WEST MISSISSIPPI DELTA AREA. Technical Report No. 1. R. F. McAllister, R. G. Bader, and G. E. Kunze. Oct. 1958. 93p. Project 142. Contract AT(40-1)-2061. $15.30(ph), $5.40(mf) OTS.

A study was made of 36 samples of surface sediment from the shallow water marine environment to the west of the Mississippi Delta. The clay fraction was examined using x-ray diffraction, differential thermal analysis, determinations of cation-exchange capacity, and electron microscopy. Clay mineral distribution was determined for the surface sediments in the area, and with depth in three cores. Montmorillonite makes up approximately 50% of the clay fraction of the sediments, with nearly 25% each of kaolinite and illite, and a small amount of halloysite. A little quartz was present in the fine fraction of all samples studied. Percentages of the clay minerals were estimated from x-ray-diffraction peak intensities, and from cation-exchange capacity data. Particular attempts to discover chlorite in the sediments were unsuccessful. Controlled heating of samples showed little evidence for a 14 A chlorite, even of low thermal stability. No evidence for clay mineral diagenesis with depth was found in the cores studied. No change in either clay mineral type or degree of crystallization could be discovered to a depth of 334 cm. Attempts to assess the damage caused by chemical methods of removing organic matter and calcium carbonate indicated that such mild and carefully controlled methods do little if any damage to the clay minerals present. No detectable difference was found in the less than 2 micron and less than 4 micron fraction of the sediments. The clay mineral distribution in the Mississippi Delta area is determined primarily by the types of clay minerals present in the soils of the Mississippi River drainage basin, and secondarily, by the rapid but minor diagene-

sis occurring immediately upon contact of these minerals with the saline water of the Gulf of Mexico. (auth)

9351 RDB(W)/TN-113
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
THE EFFECT OF ULTRASONIC AGITATION ON SURFACE DECONTAMINATION RATES. J. L. Linsley-Hood. Dec. 1953. 20p.

An account is given of investigations into the manner in which ultrasonic agitation affects the rate and degree of decontamination of various surfaces. In general, it appears that this technique increases the speed and extent of decontamination. (auth)

9352
WHAT IS SAFE WASTE DISPOSAL? Wallace de Laguna (Oak Ridge National Lab., Tenn.). Bull. Atomic Scientists 15, 35-43(1959) Jan.

The nature of radioactive wastes and their hazards is considered, and present and future methods of disposal are discussed. It is concluded that in the forseeable future the cumulative effect can lead to serious contamination of large sections of the globe. Even without genetic damage the potential hazard is considerable. Present practice is satisfactory for present needs. The problem of locating waste processing plants close to power reactors versus sites close to waste disposal areas is discussed. (T.R.H.)

9353
EFFECT OF URANIUM ORE REFINERY WASTES ON RECEIVING WATERS. E. C. Tsivoglou. Sewage and Ind. Wastes 30, 1012-27(1958)

In 1955 and 1956, surveys were made of the condition of streams receiving waste waters from uranium refining operations in the Colorado Plateau area. It was found that the gross radioactivity and concentration of soluble radium in the effluents from a number of the mills and in samples of water from some of the receiving streams exceeded the usually accepted maximum permissible amounts. All but one of the mills in operation at the time of the surveys discharged most of their wastes to tailings ponds, and at these sites the streams received only small volumes of effluent directly, in addition to seepage from the tailings ponds. At the other mill, the tailings pond was not in use and all waste waters, including sands and slimes, were discharged to the receiving stream. It was found that stream biota and samples of silt were good indicators of recent radioactive pollution, the biota reflecting mainly the concentration of soluble radioactivity in the water while the silt indicates the radioactivity in suspension. In view of the long half life of radium, the ultimate fate of radium in streams is important, and further studies are required on this subject. (auth)

REACTORS

General

9354 AECU-3933
California Research Corp., Richmond, Calif.
BROOKHAVEN REACTOR GAMMA FLUX BY CALORIMETRY. J. G. Carroll and R. O. Bolt. Oct. 22, 1958. 38p. Contract AT(11-1)-174. $1.25(OTS).

Simple calorimeters were built comprising an insulated lead rod so constructed that heat flowed in one direction. Heat induced in the lead by gamma rays caused heat to flow, producing a temperature gradient which was used as an index of gamma dose rate. The calorimeters were calibrated using accepted standards in the Canal Gamma Source at the Materials Testing Reactor. Calorimeters were then exposed in Hole E-25 of the Brookhaven Graphite Reactor while the reactor was operating at 25 megawatts on natural uranium. Gamma flux at the reactor center line was found to be 10^{12} photons/cm^2/sec. (auth)

9355 AECU-4048
Stanford Research Inst., Menlo Park, Calif.
MECHANISMS OF SURFACE ADSORPTION IN HOMOGENEOUS REACTOR LOOPS. Semi-Annual Report No. 1 for Period January 1 to June 30, 1957. H. J. Eding and E. M. Kinderman. Sept. 3, 1957. 22p. For Oak Ridge National Lab. Contract [W-7405-eng-26], Subcontract 1081. $4.80(ph), $2.70(mf) OTS.

Deposits containing fuel, fission products, and corrosion products have been observed in homogeneous reactor loops. The objective of this research program is to provide information on the formation and removal of these deposits. The initial contract period was devoted to the construction of equipment and establishment of experimental techniques. Ferric–chromic oxide and zirconium dioxide were established as the principal solid and deposit products in the experiments performed at 300°C. A study of the influence of temperature, time, and minor constituents on dehydration and crystal growth is in progress. (W.D.M.)

9356 APAE-Memo-177
Alco Products, Inc., Schenectady, N. Y.
NUCLEAR EXCURSION ANALYSIS ON THE IBM 650 (EARLY CODE). Clifford J. Stueck and Earl M. Reiback. Feb. 26, 1959. 15p. Contract AT(30-3)-326. $3.30(ph), $2.40(mf) OTS.

The early program is designed to compute the peak power and total energy release which will occur in a reactor due to a step increase of reactivity. The calculation assumes no thermodynamic delays and assumes void formation is due to heat conduction from the cladding to the moderator. For periods in the 1 to 10 msec. range, the calculation yields results which are in excellent agreement with SPERT experimental results. (W.D.M.)

9357 APEX-458
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
OFF-CRITICAL REACTOR THEORY. B. H. Duane, R. E. Reid, and D. S. Selengut. Oct. 1956. 17p. Contracts AF33(600)-38062 and AT(11-1)-171. $0.75(OTS).

Time-dependent reactor theory is manipulated into a steady-state form suitable for applying steady-state digital computer programs to numerical analysis of the off-critical case. The method is used to generalize the GE-ANPD reactor analysis programs I_2, C_2, and F_2 to time-dependent form. Improved data on delayed-neutron spectra are included. Procedures for constructing both exact solutions and differential approximations are summarized. (auth)

9358 BAW-1030
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
LIQUID METAL FUEL REACTOR EXPERIMENT; PRELIMINARY HAZARDS EVALUATION FOR THE USE OF SODIUM IN THE BNL FOUR-INCH LOOP. Oct. 1957. 10p. Contract AT(30-1)-1940. $3.30(ph), $2.40(mf) OTS.

The design changes considered necessary for the use of sodium in place of bismuth in the secondary system of the four-inch loop are discussed. An evaluation of the possible hazards involved and methods of coping with them are included. (A.C.)

9359 BLG-26
Brussels. Centre d'Étude de l'Énergie Nucléaire. DISTRIBUTION SPECTRALE DES NEUTRONS LENTS DE BR-1. (Spectral Distribution of Slow Neutrons in BR-1.) Neve de Mevergnies. Apr. 17, 1958. 32p.

In a weakly absorbing medium, the slow neutron spectrum can be represented with a good approximation by the sum of a Maxwellian distribution and of a resonance distribution following the E^{-1} law. Because of the hardening of the spectrum by absorption, the temperature T_M of the almost Maxwellian part does not correspond to the physical temperature T_p of the medium. The experimental results indicate the following equation for graphite: $T_M/T_p = 1 + (3.36 \pm 0.33) \times \phi_{epi}/\phi_{th} \times T_0/T_p$. (auth)

9360 CEA-807
France. Commissariat à l'Énergie Atomique, Paris. ANALYSE DES DONNÉES EXPÉRIMENTALES SUR LES RÉSEAUX À EAU LÉGÈRE ET URANIUM ENRICHI. (Experiments on Lightwater Lattices with Enriched Uranium Fuel.) M. Audinet, J. de Lamare, and J. Panossian. June 1958. 60p.

Experiments on light-water lattices with slightly enriched uranium fuel were performed at Brookhaven and Bettis Plant Laboratories. The results are studied and compared with simple theories on reactor calculations. By taking into account shadow effects and non-maxwellian neutron spectrum, which are important in this kind of reactors, the observed results were explained fairly well. A constituent set of formulas with which to calculate lattices similar to these is given. (auth)

9361 CEA-808
France. Commissariat à l'Énergie Atomique, Paris. DISPOSITIFS DE TRANSVASEMENT DE SOLUTIONS DE PLUTONIUM POUR UNE EXPÉRIENCE CRITIQUE. (Transfer Device for Plutonium Solutions, to be used in a Critical Experiment.) J. T. Achon. Mar. 1958. 18p.

A brief description is given of the Proserpine Reactor, a homogeneous water boiler. The different parts of the active circuit, designed to prevent alpha contamination outside the protected region, are described in detail. The means of preventing a number of possible incidents and of meeting the problems raised by these incidents are considered. (tr-auth)

9362 CEA-826
France. Commissariat à l'Énergie Atomique, Paris. INFLUENCE DES RÉACTIONS (n,2n) ET (n,α) DU BÉRYLLIUM SUR LE BILAN NEUTRONIQUE D'UN RÉACTEUR MODÉRÉ À L'OXYDE DE BÉRYLLIUM OU AU BÉRYLLIUM. CONSÉQUENCES SUR L'EVOLUTION À LONG TERME DE LA RÉACTIVITÉ. (The Influence of the (n,2n) and (n,α) Reactions of Beryllium on the Neutron Balance in a BeO or Be Moderated Reactor and Its Consequences on the Long Term Reactivity Changes.) K. Sahai, P. Benoist, and J. Horowitz. Apr. 1958. 20p.

The reaction probabilities in an infinite and homogeneous medium of BeO or Be were calculated from neutron cross section curves, for a neutron produced with an energy distribution similar to a fission spectrum. The calculation shows that after several elastic collisions the neutron still has an appreciable probability to undergo a reaction, in spite of the energy degradation in the spectrum due to each collision. This degradation was calculated, taking into account the anisotropy of the collisions. The gain of the reactivity in a reactor was obtained after correcting these probabilities for the attenuation of the flux of fission neutrons due to the inelastic scattering in the uranium. Finally, the calculation shows that in a power reactor this gain of reactivity is in practice destroyed in a few years by the accumulation of poisonous nuclei such as Li^6 and He^3 following (n,α) reactions. (auth)

9363 CEA-844
France. Commissariat à l'Énergie Atomique, Paris. REPARTITION DES NEUTRONS DANS LA CELLULE CENTRALE ET UNE CELLULE PÉRIPHÉRIQUE DE LA PILE DE FONTENAY-AUX-ROSES. (Neutron Distribution in the Central Cell and A Peripheral Cell of the Fontenay-aux-Roses Pile.) F. Roullier. May 1958. 9p.

The distribution of the neutron density was determined in the central cell and a peripheral cell of the pile at Fontenay-aux-Roses. This measurement was carried out by the autoradiographic method with manganese detectors. The neutron density distribution in the uranium rod has already been studied. The measurement was completed by the study of the neutron density in the complete cell by means of detectors placed in the uranium and in the heavy water. (auth)

9364 CF-59-2-10
Oak Ridge National Lab., Tenn.
REACTIVITY CHANGES ASSOCIATED WITH SLURRY SETTLING IN SMALL SLURRY REACTORS. C. W. Nestor, Jr. and M. W. Rosenthal. Feb. 9, 1959. 9p. Contract [W-7405-eng-26]. $1.80(ph), $1.80(mf) OTS.

The reactivity changes resulting from slurry settling were computed for a number of small one-region slurry reactors using an IBM-704 routine. Calculations were performed for three temperatures, two sizes, and five initial thorium concentrations. In general, reactivity additions on settling were observed which decreased with increasing thorium inventory, increasing temperature, and decreasing diameter. For example, at 100°C a 2.5-ft diameter "square" cylinder (height equal to diameter) showed a maximum reactivity introduction of 4% δk/k with an initial concentration of 100 g Th/l and a moderator composition of 75% D_2O, 25% H_2O; at 200°C the maximum reactivity introduction was 3.6%. With the same conditions, a 2-ft diameter "square" cylinder was subcritical on settling. For an initial thorium concentration of 400 g Th/l the 2.5-ft reactor showed a reactivity introduction of 1.4% at 100°C and 0.7% at 200°C. (auth)

9365 FZM-1047B
Convair, Fort Worth, Tex.
ASTR FAST NEUTRON SPECTRA. N. M. Schaeffer and J. R. Stokes. Oct. 10, 1958. 5p.

Presented at the Fourth Semi-Annual ANP Shielding Information Meeting, Oak Ridge National Lab., Tenn., November 19-20, 1957.

Ilford E-2 emulsions were used to measure the fast neutron spectra of the ASTR for two shield configurations, for minimum side water shielding and maximum side water shielding. During the exposures from 105° to forward centerline the reactor was mounted in the

Nuclear Test Aircraft. The measured spectra are compared with those calculated by use of the moments method. (W.D.M.)

9366 IGR-R/R-220

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

APPLICATIONS OF THE RAYLEIGH-RITZ APPROXIMATION. PART I. UPPER BOUNDS FOR THE CRITICAL LAPLACIANS OF SOME SIMPLE SOLIDS. R. T. Ackroyd and M. A. Perks. 1957. 41p. $0.70(BIS).

Two methods are given for obtaining simple upper bounds for the critical Laplacians of some simple solids. The methods are based on the variational principle for one-group diffusion theory. Upper bounds are given for the critical Laplacians of reflected, infinitely long, circular and elliptical cylinders; a reflected, infinitely long rectangular prism, and a completely reflected finite circular cylinder. In the example of a circular cylinder with a non-capturing reflector the upper bound for the critical Laplacian λ^2 is within 0.12% of the correct value. A typical fast reactor is used as an example of both methods. (auth)

9367 IGR-TN/CA-958

United Kingdom Atomic Energy Authority. Industrial Group. Capenhurst Works, Capenhurst, Ches., England.

A STATIC TRANSDUCER FOR INDICATING THE POSITION OF CONTROL RODS IN THE FAST REACTOR. A. W. Fenton. 1959. 17p.

A static electrical transducer system is described for the remote indication of the position of a control rod in a sealed high-temperature reactor vessel over a range of 25 in. to an accuracy of ±0.01 in. (J.E.D.)

9368 NASA-M-12-24-58E

National Aeronautics and Space Administration. Lewis Research Center, Cleveland.

COMPUTER PROGRAM FOR SOLVING NINE-GROUP DIFFUSION EQUATIONS FOR CYLINDRICAL REACTORS. James W. Miser, Robert E. Hyland, and Daniel Fieno. Jan. 1959. 44p.

A method is presented for determining the critical size of a cylindrical reactor by a one-dimensional group-diffusion method extended to a two-dimensional solution by prescribing values of axial leakage based on assumed flux levels. The neutron energy spectrum is divided into nine groups, and the reactor into four concentric cylinders. A computing machine program for an IBM 650 computer with attachments and a method for using the program with nine, or less, groups and four, or less, regions are given. (auth)

9369 NP-7246

Brussels. Centre d'Etudes Pour Les Applications de l'Energie Nucleaire.

ACTIVITEIT VERSPREID IN DE OMGEVING BIJ NORMAAL BEDRIJF VAN DE BR1. (Activity Scattered in the Surrounding in Normal Operation of the BR-1.) L. Vandewiele. Dec. 23, 1957. 12p.

Calculations were made of the radioactivity in the air coolant and of the gamma doses and ground concentrations during normal operation of the BR-1. The results are given. (J.S.R.)

9370 NP-7247

Brussels. Centre d'Etude de l'Energie Nucleaire.

SPECIFICATIONS CONCERNANT LA RAPPORT DE SECURITE DE BR-3. (Specifications on the Security Report of the BR-3.) H. Dopchie. July 17, 1958. 17p.

A summary is presented of the safety of the BR-3. The site and its environs are described. A major accident is considered with respect to the results, procedures, pressures in the pressure vessel, release of fission products, evacuation, meteorological conditions, doses outside the structure, and admissible doses. In an appendix more detailed information on admissible doses is presented. (J.S.R.)

9371 NP-7292

Virginia Polytechnic Inst., Blacksburg.

APPLICATION FOR ALLOCATION OF SPECIAL NUCLEAR MATERIAL. Feb. 1959. 76p., 2 illus. $13.80 (ph), $4.80(mf) OTS.

A construction permit to cover the installation of a 10-kw "ARGONAUT-type" reactor, designated as UTR-10 by the manufacturer, American Standard Atomic Energy Division, is sought. The facility will be used in the reactor physics laboratory portion of the nuclear engineering program at Virginia Polytechnic Institute. A critical assembly of MTR-type fuel elements, UAl_4 + Al with uranium enriched to 90% U^{235}, will be operated in a light water moderated, graphite reflected reactor system. Site geology, reactor design, and operational hazards evaluations are included. (A.C.)

9372 NP-7320

Detroit Edison Co., Detroit.

DETERMINATION OF THE MAXIMUM PRESSURES ATTAINED DURING THE REACTION OF SODIUM WITH AIR IN CLOSED SYSTEMS. Engineering Laboratory and Research Department Report 55C80. Edward Hines and J. K. Kelley. Feb. 15, 1956. 29p.

Tests were conducted to gather data on the maximum pressure to be expected in the reaction of molten sodium at 850°F with air above the operating floor of a nuclear power plant in an equipment failure incident. Preliminary studies were made using a 1 liter reaction vessel. In subsequent tests 92 and 532 liter vessels were used. The results of the tests made with the 532 liter container are of interest. The procedure is outlined, and an analysis of results is given. It was concluded that under conditons similar to those in the test, a pressure not exceeding 38 psig would develop in the reactor house. Decreasing the oxygen content to 14 vol. % has little effect on reaction pressures. (J.R.D.)

9373 NP-7325

Nucledyne Corp., Chicago.

PROPOSAL FOR GRAPHITE EXPONENTIAL EXPERIMENT. [1957]. 13p.

An exponential assembly was designed for use by schools. Basically it is a small nuclear reactor in which the leakage of neutrons prevents a divergent chain reaction from taking place. Since it never becomes critical, a neutron source is required. The basic fuel component is natural uranium. The total fuel content in the proposed graphite exponential assembly is 1418.4 kg. An Sb–Be or Pu–Be neutron source will be used. (A.C.)

9374 NP-7326

Nucledyne Corp., Chicago.

PROPOSAL FOR THE DESIGN AND CONSTRUCTION OF A 10 KW REACTOR. [nd]. 34p.

The proposed reactor design fulfills the requirement for a flexible training reactor facility with a high flux-to-power ratio. Essential features of the MTR type core include large negative temperature and void coefficients plus two independent shutdown mechanisms. The core is

a water-cooled aquarium-type lattice which is graphite reflected on the sides and water reflected on the top and bottom. An average thermal flux 8×10^{10} in the fuel is expected when the reactor is operating at 10 kg of U^{235}. (W.D.M.)

9375 NP-7328
Nucledyne Corp., Chicago.
PROPOSAL FOR LIGHT-WATER MODERATED SUB-CRITICAL ASSEMBLY. [1957]. 9p.

A preliminary proposal is presented for a light water moderated sub-critical assembly consisting of a lattice of 217 fuel rods containing 5500 lbs of U suspended in an aluminum tank. The construction is of type 6061 T6 aluminum throughout. Possible experiments with this assembly are discussed. (W.D.M.)

9376 NP-7330
Aerojet-General Nucleonics, San Ramon, Calif.
REACTOR HAZARDS EVALUATION REPORT AND SITE SURVEY FOR THE AGN 211 NUCLEAR REACTOR. Oct. 1957. 41p. $7.80(ph), $3.30(mf) OTS.

The potential hazards associated with operation of the AGN 211 Nuclear Reactor in the Aerojet-General Nucleonics plant in San Ramon, Contra Costa County, California are evaluated. The characteristics of the reactor, the suitability of the site, operating procedures, emergency plans, administrative control, and experience of the personnel are reviewed. Particular attention is given to the site location in respect to the seismology of the area. The conclusion is reached that, at the design power level of 1 watt this compact reactor is sufficiently safe to justify operation at the described industrial site. (auth)

9377 NYO-2608
Rensselaer Polytechnic Inst., Troy, N. Y.
A PULSED SUBCRITICAL URANIUM ASSEMBLY FOR EDUCATIONAL USES. Progress Report No. 4 for the Period July 1 to December 31, 1958. 50p. Contract AT(30-1)-294. $9.30(ph), $3.60(mf) OTS.

The design, construction, and use of a subcritical assembly, intended for college teaching of reactor physics and of associated nuclear phenomena, are described. The report is written as a short cumulative progress report on the assumption that it may be of more value than status reports describing the work done in successive periods. (W.D.M.)

9378 NYO-4721
Technical Operations, Inc., Arlington, Mass.
THE APPLICABILITY OF EXPERIMENTAL DESIGN TO THE REACTOR SAFETY PROGRAM. Thomas E. Cheatham, Jr. and Miller N. Hudson. Dec. 12, 1956. 46p. Contract AT(30-1)-1889. (TOW-56-4). $7.80(ph), $3.30(mf) OTS.

A brief review of the principal techniques of experimental design is presented, followed by specific considerations of possible applications to the Reactor Safety Program. (auth)

9379 NYO-4723
Technical Operations, Inc., Arlington, Mass.
A STOCHASTIC MODEL OF REACTOR OPERATIONS. J. B. Friedman and R. A. Langevin. Dec. 12, 1956. 25p. Contract AT(30-1)-1889. (TOW-56-8). $4.80(ph), $2.70(mf) OTS.

As a basis for investigation of the safe operation of reactors, a simple mathematical model of a reactor control system was constructed. The model is not intended to give quantitative results about a reactor control system, but should provide a framework within which the relative safety of various alternatives can be evaluated. The model discussed was designed to bring into focus the interaction of the operator with the physical components of the reactor. (W.D.M.)

9380 NYO-4724
Technical Operations, Inc., Arlington, Mass.
FALLOUT AS A REACTOR HAZARD. Paul I. Richards. Nov. 19, 1956. 8p. Contract AT(30-1)-1889. (TOI-56-31). $1.80(ph), $1.80(mf) OTS.

A brief review of fallout-producing possibilities in a nuclear reactor accident indicates that the primary eruption presents a negligible hazard in this respect as compared with smoke from subsequent chemical fires. It is recommended that prime safety emphasis lies in the prevention of chemical fires, and it is pointed out that "self-sealing" buried installations would be especially safe in these and other respects. (auth)

9381 NYO-4726
Technical Operations, Inc., Arlington, Mass.
INITIAL SHUTOFF IN A REACTOR TRANSIENT. Eric T. Clarke. Dec. 12, 1956. 37p. Contract AT(30-1)-1889. (TOI-56-32). $6.30(ph), $3.00(mf) OTS.

Data from the reactor transient test facility SPERT-1 are analyzed to see if the observed behavior can be predicted on the basis of reactor theory and the physics of heat flow. It is shown to be most unlikely that the initial shutoff can be ascribed to thermal effects alone. A possible mechanism envisaging the generation of nuclear poison of short duration is proposed and shown to be capable of accounting for the salient phenomena. An appendix contains a novel approach to heat flow through slabs; mathematics completely analogous to those for electrical transmission lines are developed and shown to be particularly applicable to problems with exponential heat input. (auth)

9382 RDB(W)/TN-57
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
A PRELIMINARY SURVEY OF THE ADVANTAGES OF INCREASING THE URANIUM ROD DIAMETER IN THE WINDSCALE PILES. R. R. Gallie and W. B. Hall. Mar. 11, 1953. 6p. (WTSC/R-41).

It is shown that a gain of at least 8.5 per cent in plutonium production can be achieved by using uranium rods of 1.2 inches diameter. In addition, there would be a money saving of 80,000 pounds per annum on enriched metal. (auth)

9383 RDB(W)/TN-80
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
THE CONTROL SYSTEM OF THE WINDSCALE PILES. E. Smart and R. R. Gallie. July 1953. 20p.

The information available on the control system of the Windscale reactors is discussed, and recommendations are made for experiments which are necessary to give fuller information. (auth)

9384 RDB(W)/TN-157
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
A REVIEW OF PROGRESS ON JOB 4040: THE RELEASE OF WIGNER ENERGY FROM PILE GRAPHITE (AUGUST 1, 1953 TO JUNE 18, 1954). J. C. Bell and G. F. Jackson. July 1954. 14p. (WTSC/R-163).

Work on the release of Wigner energy from pile graphite has been continued at Windscale, and the monitoring of the energy content of the graphite of the piles is now on a routine basis. Work is also continuing on the more accurate measurement of the energy

content by means of an adiabatic system; and a program of work on the build-up of energy with long irradiations is in hand. (auth)

9385 TID-2503(Del.)(p.423-31)
North American Aviation, Inc., Downey, Calif.
EFFECT ON REACTOR PERFORMANCE OF ALLOYING ELEMENTS AND METALLIC BONDS. E. F. Weisner. p.423-31 [of] NUCLEAR SCIENCE AND TECHNOLOGY. (EXTRACTS FROM REACTOR SCIENCE AND TECHNOLOGY. VOL. 2, ISSUES 1 TO 4, APRIL–DECEMBER 1952.) 9p. (NAA-SR-Memo-331).

The use of small amounts of alloying elements and thin layers of bonding materials may be given serious consideration for use in reactors employing uranium metal fuel. The effect on plutonium production which results from the use of alloyed or bonded fuel is small, provided that the alloying or bonding is accomplished with small amounts of low-cross-section elements. In general, the effect on conversion ratio and plutonium production is much less for reactors which use slightly enriched fuel than for reactors which use natural-uranium fuel. These conclusions hold for any practical, realizable fractional burn-up of the fuel, since this quantity was not a factor in the discussion. (auth)

9386 TID-2503(Del.)(p.433-7)
North Carolina State Coll., Raleigh.
MULTIPLICATION CONSTANTS FOR HETEROGENEOUS REACTORS WITH INTERNALLY COOLED SLUGS BY AN APPROXIMATE METHOD. R. L. Murray and A. C. Menius, Jr. p.433-7 [of] NUCLEAR SCIENCE AND TECHNOLOGY. (EXTRACTS FROM REACTOR SCIENCE AND TECHNOLOGY. VOL. 2, ISSUES 1 TO 4, APRIL–DECEMBER 1952.) 5p. (NCSC-52).

This abstract replaces abstract 17365 of NSA, Vol. 12.

A method is presented for making rapid estimates of the multiplication constants k_∞ of heterogeneous reactors with internally cooled cylindrical slugs. The actual system is approximated by a simpler one-group two-region problem having the same moderator-to-uranium flux ratio, from which f and p may be computed. Graphs of the fast fission factor ϵ for hollow cylinders are obtained from the more general treatment. (auth)

9387 WAPD-PWR-PH-351
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
REPRODUCIBILITY OF MEASUREMENTS IN THE REACTIVITY MEASUREMENT FACILITY. S. B. Gunst. Aug. 22, 1958. 13p. $3.30(ph), $2.40(mf) OTS.

Variations obtained in RMF measurements and a simple procedure for taking and processing RMF data are described. The procedure yields relative reactivities which exhibit long-term consistency and reproducibility despite variations in measurements associated with temperature or other changes. By the use of the relative reactivities, the need for sensitivity recalibrations during each period of RMF operation is eliminated, calibration precision is improved, and the importance of having a minimum temperature coefficient of reactivity for the RMF is lessened. (auth)

9388 WKNL-53
Kidde (Walter) Nuclear Labs., Inc., Garden City, N. Y.
NEUTRON AND GAMMA FLUX DISTRIBUTION WITHIN THE WESTINGHOUSE TEST REACTOR. William C. Bartels. Jan. 9, 1956. 14p. For Westinghouse Electric Corp. Commercial Atomic Power Activity.

The purpose of the studies considered was to estimate the transverse of fast flux, slow flux, and gamma flux from the center of the core through the shield. The calculations cover extreme loading conditions. The flux calculations are to be used primarily to determine optimum instrument location. (W.D.M.)

9389 WKNL-54
Kidde (Walter) Nuclear Labs., Inc., Garden City, N. Y.
OPTIMUM THIMBLE DESIGN FOR THE WESTINGHOUSE TEST REACTOR CORE, AND RESULTING NEUTRON FLUXES INSIDE THE THIMBLES. Jan. 10, 1956. 8p. For Westinghouse Electric Corp. Commercial Atomic Power Activity.

Some of the results of reactor analyses on the Westinghouse Test Reactor are presented. A study to determine the optimum thimble material for WTR was performed. The study included a determination of thermal neutron flux within the thimble for various materials and various thimble contents. The analysis also included the effects of gamma heating and a study of thermal stresses resulting from gamma heating. (W.D.M.)

9390 WKNL-61
Kidde (Walter) Nuclear Labs., Inc., Garden City, N. Y.
CRITICAL EXPERIMENT PROGRAM FOR THE WESTINGHOUSE TESTING REACTOR. William C. Bartels. May 29, 1956. 32p. For Westinghouse Electric Corp. Commerical Atomic Power [Activity].

A program of experiments is presented which includes measurements of critical size, neutron flux, migration area, and control rod effectiveness as well as reactivity measurements to determine fuel and poison worth and burnout effects. Some measurements giving necessary engineering information are also discussed. A possible set of safety rules and procedures for conducting critical experiments in the Reactivity Measurement Facility are given. (W.D.M.)

9391 CEA-tr-A-510
LA CENTRALE NUCLÉAIRE R.W.E. A KAHL. (The R.W.E. Nuclear Power Plant at Kahl.) H. Mandel. Translated into French from Atomwirtschaft 2, 253-5 (1957). 11p.

The center of nuclear studies at Kahl is designed to obtain technical and financial information on the design, construction, and operation of nuclear power plants. A closed cycle boiling water reactor with a net power of 15 Mw will be constructed at the site which will be developed later into a power station. The layouts of the reactor and the electrical plant are described. The safety and control of the reactor are discussed. (J.S.R.)

9392
STOP DEVICE FOR NUCLEAR REACTOR FUEL ELEMENTS. (To United Kingdom Atomic Energy Authority, London.) German Patent DAS 1029 495. Atompraxis 5, 42(1959). (In German)

At the end of a fuel element are one or more stop devices provided which have a support whose shrinkage or deformation resistance is greater than that of the shielding material. This part is solidly bound to the shielding and so arranged that the stress which is caused by the weight of the fuel elements is transmitted directly to the stops. The stops can be placed at one end of the fuel element in such a way that a suspended fuel element stressed by tension can not be distorted.

9393
CONTROL OF THE CHAIN REACTION BY REGULATION OF THE MODERATOR REFLECTOR IN A HEAVY

WATER REACTOR. (To Kernreaktor Bau- u. Betriebs-Gesellschaft mbH., Karlsruhe, Ger.) German Patent DAS 1031 900. Atompraxis 5, 42(1959). (In German)

The control of the chain reaction in a heavy water reactor can be obtained by pneumatic regulation of the moderator mirror by standardization of the gas excess pressure in a supplementary container connected below or beside the reactor. The surface of the container would lie below the moderator mirror, and the water discharged from the moderator space would be introduced into the gas or liquid space with liquid compression. Therefore a rapid draining of the moderator as well as exchangeability of the fuel elements would be possible.

9394

GAS COOLED NUCLEAR REACTOR IN WHICH THE MODERATING SYSTEM IS SEPARATED FROM THE COOLANT SYSTEM BY A BARRIER LAYER. (To Siemens-Schuckertwerke AG., Berlin u. Erlangen, Ger.) German Patent DAS 1031 901. Atompraxis 5, 42(1959). (In German)

A liquid barrier would be provided between moderator and coolant in gas-cooled, liquid-moderated reactors in which the moderating system and coolant system have pressure equalization. As barrier substance, a deuterated organic liquid with moderating or reflector properties, which floats on the moderator liquid, would be used. In this manner, fission products from defective fuel elements would not pass from the coolant system to the moderator.

9395

NEW METHOD FOR THE ACCOMPLISHMENT OF NUCLEAR REACTIONS IN A BREEDER REACTOR. (To Brown, Boveri & Cie AG., Mannheim.) German Patent DAS 1032 432. Atompraxis 5, 42(1959). (In German)

It was proposed to load a breeder reactor after attainment of stationary operating conditions only with fission-free breeder elements and to use this breeder material, after a given saturation ratio was produced in them by neutron irradiation, in the same reactor as fuel elements without previous withdrawal or other preparation. The time consuming and costly chemical preparation of the fissionable materials would then be avoided.

9396

REACTOR WITH GRANULAR MIXTURE OF FISSIONABLE MATERIAL AND A HEAT CARRIER. (To Stichting Reactor Centrum, Hague.) German Patent DAS 1033 809. Atompraxis 5, 43(1959). (In German)

In a nuclear reactor a mixture of spongy, preferably spherical, particles should be used as fissionable material and heat carrier. The particle diameters should be between 50 and 500μ, preferably at 175μ. This particle size was proved advantageous with respect to the heat transfer and the vorticity during the cycle. A decomposition of the particles is not feared.

9397

NUCLEAR REACTOR WITH CHARGE OF HOMOGENEOUSLY CAST BREEDER ELEMENTS. (To Dr. Rudolf Schulten, Mannheim, Ger.) German Patent DAS 1034 784. Atompraxis 5, 42(1959). (In German)

A reactor was proposed in which the breeder mantel would consist of a charge of homogeneous cast breeder elements, so that the breeder element has the same shape as the fuel elements. By this method it would be possible to use the breeder element after its irradiation immediately for the charging of the fuel elements.

9398

NUCLEAR REACTOR WITH REPLACEMENT INSTALLATIONS BETWEEN THE FUEL LATTICE. (To Siemens-Schuckertwerke AG., Berlin u. Erlangen, Ger.) German Patent DAS 1033 808. Atompraxis 5, 43(1959). (In German)

In a gas-cooled or boiling water reactor with rod lattice whose fuel rods are hollow cylinders and are in contact on the inside as well as on the outside with a flowing coolant, replacement installations which are massive or hollow, cylindrical, or prismatic bodies are arranged in the gaps between the rod lattice. In this manner the proportional external diameter of each fuel element or the corresponding volume was determined from the corresponding measurements of the internal flow channel.

9399

CONSTRUCTION OF THE FRANKFURT REACTOR. H. Seifert. Bautechnik 35, No. 6, 248-51(1958).

The graphite-moderated reactor, in addition to being surrounded by dense concrete shields, is housed in a steel reactor building that is itself gasproof and has a cellar that is impermeable to ground water. As further precautions against overheating, four braking rods are included in the design, and the density of the moderator can be lowered by the formation of gas bubbles in the liquid fuel, so that on removing the liquid fuel into an overflow vessel the reactor becomes subcritical. (auth)

9400

THERMAL STRESSES IN REACTOR SHELLS DUE TO THERMAL NEUTRON IRRADIATION. I. M. J. Hillier (Rolls Royce Ltd., Derby, Eng.). J. Nuclear Energy 8, 187-96(1959) Jan.

Assuming that the thermal neutron flux through a flat slab can be expressed as the sum of exponential terms, the heating effects due to capture γ-ray absorption are calculated. Curves are presented for total heat absorbed, peak temperature and peak thermal stress for a simple attenuation of neutrons through the slab. The results are applicable to the heating effects in pressure vessel shells. (auth)

9401

TABULATION OF POWER AND RESEARCH REACTORS OF WEST GERMANY. Nucleonics 17, No. 2, 100-1 (1959) Feb.

The following information is presented on reactors of West Germany: name of reactor, location, owner, operator, foreign contractor for reactor, main contractor, reactor type, fuel, moderator, reflector, power, neutron flux in reactor center, cooling system, control, shielding, and experimental facilities. (J.H.M.)

9402

W. H. ZINN EVALUATES RUSSIAN REACTOR PROGRESS. W. H. Zinn (General Nuclear Engineering Corp. Dunedin, Fla.). Nucleonics 17, No. 3, 104-7, 109(1959) Mar.

An evaluation of U.S.S.R. progress in reactor technology based on the Russian presentation at the 1958 Geneva Conference is presented. Examples are cited to support impressions the Russian program is progressing rapidly and is as comprehensive as that of the U.S.A. (T.R.H.)

9403

FUNDAMENTAL ASPECTS OF REACTOR SHIELDING. Herbert Goldstein. Reading, Mass., Addison-Wesley Publishing Company, Inc., 1959. 426p. $9.50.

Factors affecting permissible radiation levels are discussed, as well as sources and characteristics of

the radiation to be shielded. Information is included on how bulk shielding measurements are made and, in more detail, how one calculates, theoretically or empirically, the attenuation of neutrons and gamma rays in shield materials. (J.H.M.)

Power

Refer also to abstract 8728.

9404 AECU-4002
Duquesne Light Co., Shippingport, Penna.
INITIAL START-UP AND LOW POWER OPERATION SPECIAL PROCEDURE. SECTION I. Test Results DL-S-161 (T-550127). First Issue, Jan. 14, 1959. 9p. $1.80(ph OTS); $1.80(mf OTS).

Test results of initial start-up and low-power operation are discussed. The data included information for only one load change because of difficulty with the decay heat removal valve. During the load change, the power level increased rapidly after opening the valve, necessitating a manual rod-height decrease. The coolant temperature decreased as was expected, followed by a gradual increase after the valve was closed. Other test results are discussed, and descriptions of the test equipment and procedures are given. (J.R.D.)

9405 AECU-4003
Duquesne Light Co., Shippingport, Penna.
REACTOR COOLANT LOOP OUTAGE TEST. SECTION I. SECOND PERFORMANCE. Test Results DL-S-170 (T-554928-A). First Issue, Jan. 15, 1959. 13p. $3.30 (ph), $2.40(mf) OTS.

A test was conducted to determine the temperature transient experienced as a result of the loss of an operating loop during power operation, when the main coolant hydraulic stop valves remain open. The temperature transients in the affected loop had no effect on operation of the remaining portions of the plant. In addition, the adequacy of the procedure for removing a loop from service when the reactor is critical was demonstrated. (J.R.D.)

9406 AECU-4004
Duquesne Light Co., Shippingport, Penna.
GOVERNOR PERFORMANCE TESTS. SECTION IV. SECOND PERFORMANCE. Test Results DL-S-174. First Issue, [Jan. 1959]. 5p. $1.80(ph), $1.80(mf) OTS.

The load at which each of the governor valves opens with a primary plant T_{avg} of 500°F was determined. It was found that the No. 2 valve opened at a generator load of 16.6 Mw, the No. 3 valve opened at a generator load of 33.6 Mw, and the No. 4 valve opened at a generator load of 48.4 Mw. (auth)

9407 AECU-4005
Duquesne Light Co., Shippingport, Penna.
FLOW DISTRIBUTION ACROSS THE CORE. SECTION II. Test Results DL-S-182 (T-550097). First Issue, Jan. 13, 1959. 12p. $3.30(ph), $2.40(mf) OTS.

Flow mixing characteristics of the lower plenum appears to be quite small. The temperature indicated by the thermocouple nearest the cold loop decreased approximately 15°F. The cold loop temperature was 15°F below the initial reactor coolant average temperature when the cold loop was placed in service. The thermocouple furthest from the cold loop showed little or no change in temperature. The rate of change of reactor coolant temperature for pumps on "SLOW" speed was always less than that for pumps on "FAST" speed during comparable runs. (auth)

9408 AECU-4015
Duquesne Light Co., Shippingport, Penna.
MONTHLY OPERATING REPORT [FOR] DECEMBER 1958. 46p. Contract AT(11-1)-292. $7.80(ph), $3.30 (mf) OTS.

The station remained shutdown during the entire month of Dec. 1958, while repair work continued on the No. 1 main turbine-generator and its moisture separator. Chemical conditions for both the reactor plant and turbine plant are discussed. Work by the health physics group is described. Maintenance, testing, and training are summarized. (For preceding period see AECU-3986.) (W.D.M.)

9409 AECU-4027
Duquesne Light Co., Shippingport, Penna.
REACTOR AUTOMATIC CONTROL AND LOAD SWING TESTS. SECTION I. Test Results DL-S-164 (T-554924). First issue, Feb. 10, 1959. 110p. $18.30 (ph), $6.30(mf) OTS.

The Reactor Power and Temperature Control System satisfactorily controlled rod movements to maintain all primary plant parameters within their individual limits during steady state operation, ramp function load changes, and a peak xenon burnout transient. The operational characteristics of the station during load swings indicate the primary system will follow the secondary system and return to a steady state conditon. The results are for three loop operation only. (auth)

9410 AECU-4028
Duquesne Light Co., Shippingport, Penna.
STATION START-UP TEST. SECTION I. Test Results DL-S-163 (T-554923). First Issue, Jan. 31, 1959. 15p. $3.30(ph), $2.40(mf) OTS.

The station operating characteristics during a startup with all reactor coolant loops initially cold, requiring chemical additions, and the turbine cold were determined. (auth)

9411 APAE-Memo-178
Alco Products, Inc., Schenectady, N. Y.
SM-1 (FORMERLY APPR-1) RESEARCH AND DEVELOPMENT PROGRAM; INTERIM REPORT ON CORE MEASUREMENTS. Task No. VII. S. D. MacKay, D. C. Tubbs, and R. O. Bagley. Mar. 1, 1959. 88p. Contract AT(30-3)-326. $9.30(ph), $3.60(mf) OTS.

Physics experiments were performed on the SM-1 (formerly APPR-1) core to evaluate temperature and pressure coefficients, transient xenon, neutron source requirements, safety margin, and core reactivity as a function of core life. The temperature coefficient was measured as -3.5 ± 0.13 cents/°F at 443°F several times throughout life and no change with life time is thus far indicated. The hot to cold reactivity change (440 to 70°F) was 6.70 dollars. The pressure coefficient was 1.05 ± 0.05 cents per 100 psi at 115°F. Reactivity value for equilibrium xenon was found to be 3.32 dollars and peak xenon reactivity was 4.64 dollars. The 15 curie Po Be source and the beryllium photoneutron source have proved adequate for safe startup. The safety margin "80% rod insertion" was found to depend strongly upon the rod configuration. The core reactivity has decreased approximately 5.8 dollars up to 9.1 Mwyr leaving an estimated 5.6 dollars to be used. The core life is expected to be 15 Mwyr. All measurements indicated satisfactory performance of the (SM-1) core. (auth)

9412 BAW-1042(Rev.)
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
NUCLEAR MERCHANT SHIP REACTOR PROJECT QUARTERLY TECHNICAL REPORT [FOR] OCTOBER—DECEMBER 1957. 81p. Contract AT(30-3)-274. $13.80(ph), $4.80(mf) OTS.

Additional minor details of the propulsion system were modified during this period. A revised arrangement of the secondary shielding now includes a forward vestibule between the containment vessel and shield for the location of external reactor system components, particularly for the replacement of ion exchangers. Minor modifications of the containment cupola to house the control rod drives were confirmed. The basic design of most reactor auxiliary systems is complete. Only the waste collection and drain system, the control panel design, the radiation monitoring system, and the refueling system require further basic design work. The control rod effectiveness of boron—stainless steel rods with stainless steel fuel element cans was evaluated. As a result, the range of consideration of burnable poisons and soluble poisons likely to be required was more firmly established, and confirmation of exact values required awaits only operation of the critical experiment. Arrangements were made to construct a small-scale model of the containment vessel and its internal components to verify erection procedures and clearances between equipment for maintenance. Further studies were made on the optimization of the primary and secondary shielding in preparation for conferences on secondary shielding design with the newly selected shipbuilder. Modifications to the reactor control system were developed to provide maneuvering rates comparable with other merchant ships; the incorporation of these modifications is yet to be negotiated with the AEC. The design of the buffer seals was developed to the point where buffer charge pumps could be sized and their specifications issued. (For preceding period see BAW-1023.) (auth)

9413 BAW-1110
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
THE EFFECTS OF FISSION PRODUCT LEAKAGE OF THE NMSR PLANT. D. W. Montgomery. May 1958. 66p. Contract AT(30-3)-274. $12.30(ph), $4.50(mf) OTS.

The distribution of fission products which would escape from the fuel in a defective pin into the primary coolant stream and concentrate in the purification and gaseous waste collection system is predicted. Once the distribution is known, the amount of products can be determined by normalization to a chosen radiation level. The well known corrosion properties of oxides coupled with AEC Bettis Plant tests of UO_2 allow one to predict, by theoretical means and empirical constants, the amount of fission products which can be expected as a function of the amount of fuel which is exposed. The extrapolation from the amount of fuel exposed to the number of pins which are leaking appears to be most difficult if not impossible as it would have to include the effects of the size and location of the defect, past history of the fuel, fuel operating conditions and pin location in the core. The results of this calculation should be taken as an expected distribution of products with leakage rather than a measure of the total pins leaking. The distribution and relative amounts of products are the quantities of interest rather than the number of pins. For ease of discussion and calculation, the equations are based on the amount of fuel, 1530 grams, in a pin operating at average power. (auth)

9414 BAW-1130
Virginia. Univ., Charlottesville.
COBALT ACTIVITY BUILDUP IN THE NUCLEAR MERCHANT SHIP REACTOR. J. L. Meem. Oct. 1, 1958. 24p. For Babcock and Wilcox Co. Atomic Energy Div. $4.80(ph), $2.70(mf) OTS.

An investigation was conducted to determine the concentration of cobalt allowable as an impurity in steel which would give no greater activity from cobalt-60 than from cobalt-58. A set of differential equations to describe the activity buildup was derived. Solutions were found for the equations and the constants evaluated from APPR-1 data. Calculations were then made for the Nuclear Merchant Ship Reactor. Results are presented tabularly and graphically. (J.R.D.)

9415 BMI-1245
Battelle Memorial Inst., Columbus, Ohio.
CRITICAL-ASSEMBLY EXPERIMENTS ON A REFLECTOR CONTROL SYSTEM FOR A BOILING REACTOR. David A. Dingee, William S. Hogan, Robert G. Wilson, William C. Ballowe, Francis J. Jankowski, and Joel W. Chastain. Dec. 20, 1957. 50p. Contract W-7405-eng-92. $7.80(ph), $3.30(mf) OTS.

Research directed toward an evaluation of a reflector control scheme for a small boiling heterogeneous reactor is reported. The control method uses the ambient reactor steam pressure to adjust the height of a radial water reflector. Critical-assembly experiments were conducted to measure the reflector worth and the effect of nonhomogeneous voids. The critical-assembly core approximated a right circular cylinder 24 in. high and 21 in. in diameter. The core was made up of polyethylene strips to simulate water channels, aluminum strips, and uranium foil. The reflector consisted of polyethylene blocks and two different densities were used to simulate two different water temperatures. The cold-water, hot non-power-producing, and boiling power-producing reactor conditions were mocked-up. These conditions were obtained by voiding the moderator plastic strips. The results indicate that sufficient reactivity is available in the reflector to compensate for large power variations and equilibrium poisons. However, the reactivity worth is not great enough in the system considered to include startup from the cold condition or long-time fuel burnup. These experiments also show that in calculations of critical mass and reflector worth the assumption of uniform void distributions seems valid for cores of the size studied. (auth)

9416 BNL-483
Brookhaven National Lab., Upton, N. Y.
THORIUM—U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 205p. $3.50(OTS).

Fifty-four papers were presented on the following subjects: basic physics, thorium crudes to fuel grade thorium, preparation and radiation experience with solid and fluid fuels, chemical reprocessing, fuel recycle, and handling. Separate abstracts have been prepared for each paper. (W.L.H.)

9417 BNL-483(p.3-5)
Division of Reactor Development, AEC.
THE THORIUM TEAM. Clark Goodman. p.3-5 [of]

THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The United States program of developing the thorium–U^{233} fuel cycle is discussed. This program includes the development of economic methods of recovering Th from its ores, the utilization of Th in the most suitable forms of fertile materials, the recovery of U^{233} and its economic fabrication into fuel by remote control means, and the development of power reactors which either have a high conversion ratio or actually breed. (W.L.H.)

9418 BNL-483(p.6-8)
Brookhaven National Lab., Upton, N. Y.
THE THORIUM CYCLE. F. T. Miles. p.6-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The thorium cycle is discussed beginning with the separation of thorium from its ores through the chemical separation of Th, Pa, and U^{233} and the recycle of the recovered Th. The in-pile production scheme for U^{233} from Th is presented. (W.L.H.)

9419 BNL-483(p.9-11)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
ADVANCED THORIUM REACTOR. Sidney Siegel. p.9-11 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The program for the development of the Advanced Thorium Reactor is outlined. The use of Be in the place of graphite is discussed. The neutron physics in the intermediate energy region is discussed. (W.L.H.)

9420 BNL-483(p.12-13)
Oak Ridge National Lab., Tenn.
CIRCULATING HOMOGENEOUS AND FLUID FUEL THORIUM BREEDING REACTORS. R. N. Lyon. p.12-13 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

The advantages and disadvantages of fluid fuel reactors are presented. An outline of some of the technical problems which occur in the utilization of Th in circulating homogeneous reactors is presented. (W.L.H.)

9421 BNL-483(p.14-19)
Argonne National Lab., Lemont, Ill.
THORIA BOILING REACTORS. J. A. Thie. p.14-19 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 6p.

A description is presented of the Borax(IV) plant. The core loading, fuel element characteristics, and lattice constants are described. The initial set of experiments were concerned with obtaining information on the inherent shutdown mechanisms coming into play after the rapid ejection of a control rod. (W.L.H.)

9422 BNL-483(p.20-2)
Brookhaven National Lab., Upton, N. Y.
LIQUID METAL FUEL REACTOR. Clarke Williams. p.20-2 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The U–Bi liquid metal fuel reactor systems were originally conceived as a Th–U^{233} breeder power reactor system. The most promising moderator and core structure material is graphite. Various liquid metal breeding blanket compositions are described. (W.L.H.)

9423 BNL-483(p.23-35)
Babcock and Wilcox Co., New York.
THE CONSOLIDATED EDISON THORIUM REACTOR. Frank Ward. p.23-35 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 13p.

A detailed description is given of the power station and reactor plant. Operating features of the reactor are included. (W.L.H.)

9424 BNL-483(p.36-45)
American-Standard. Atomic Energy Div., Mountain View, Calif.
SURVEY OF Th–U^{233} TECHNOLOGY. A. Ottenberg. p.36-45 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 10p.

Physics data and the problems of reactor design, control, and fuel cycle, including processing and fabrication, are presented for the Th–U^{233} fuel cycle. The Los Alamos U^{233} processing flowsheet is included along with a diagram of nuclear reactions occurring in the neutron irradiation of Th. A flowsheet is presented for the Thorex process along with the long and short time cooling schemes for irradiated Th prior to Thorex processing. (W.L.H.)

9425 BNL-483(p.49-51)
Brookhaven National Lab., Upton, N. Y.
THE THORIUM RESONANCE INTEGRAL. D. J. Hughes. p.49-51 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

Some thermal cross sections in Th are presented. The best values are $\sigma_{act} = 7.34 \pm 0.15$ b and $\sigma_{abs} = 7.52 \pm 0.16$ b. Measurements made by various groups on the resonance integral of Th are reported. The thermal neutron cross sections in U^{233} are $\sigma_f = 532 \pm 6$ b and $\sigma_{abs} = 588 \pm 7$ b. (W.L.H.)

9426 BNL-483(p.52)
Argonne National Lab., Lemont, Ill.
GENERAL COMMENTS ON REACTOR DESIGN INVOLVING U^{233} AND THORIUM. B. I. Spinrad. p.52 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

The design of thermal lattices using U^{233} in thorium as the fertile material is discussed briefly. (W.L.H.)

9427 BNL-483(p.53)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
NEUTRON YIELDS FOR U^{233}. R. J. Beeley. p.53 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

Investigation of cross section curves to obtain average

values of η over eight energy groups for U^{233} are reported. (W.L.H.)

9428 BNL-483(p.54-5)
Oak Ridge National Lab., Tenn.
EFFECTIVE RESONANCE INTEGRAL OF THORIUM. Lawrence Dresner. p.54-5 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Three separate measurements of the effective resonance integral of Th rods are reported. The measurements do not agree with one another at all. It appears that there is no reliable absolute measurement of the effective resonance integral for Th. (W.L.H.)

9429 BNL-483(p.56)
Brookhaven National Lab., Upton, N. Y.
EFFECTIVE RESONANCE INTEGRAL IN THORIUM. R. Sher. p.56 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

Measurements of the resonance escape probability in lattices fueled by 0.387-inch-diameter rods of 2% U^{235}–98% Th metal are reported. (W.L.H.)

9430 BNL-483(p.57-8)
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
MEASUREMENTS OF THE EFFECTIVE RESONANCE INTEGRAL OF THORIUM AND THORIUM OXIDE. William G. Pettus. p.57-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Data are presented on the effective resonance integral of Th^{232} metal rods six inches long with an average density of 11.7, ThO_2 rods six inches long with an average density of 7.1, Th^{232} plates six inches long and 1.016 inches wide, and ThO_2 rods six inches long with an average density of 2.6. (W.L.H.)

9431 BNL-483(p.59-60)
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
AGE DETERMINATION FROM CETR CRITICAL ASSEMBLY DATA. Clifford J. Heindl. p.59-60 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

An assembly consisting of 14.5% by volume Th, 85% polyethylene tape containing U^{235} oxide fuel, 24% Al, and 53% light water was brought to criticality at a series of seven different water heights by changing its radius. At each critical height, small perturbations were made in water level in both increasing and decreasing directions, and resultant periods measured. The average rate of change of reactivity with water height obtained at each level is listed. (W.L.H.)

9432 BNL-483(p.61-72)
Argonne National Lab., Lemont, Ill.
AGE AND RESONANCE ESCAPE PROBABILITY FOR THE THUD CRITICAL. W. C. Redman. p.61-72 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 12p.

The term THUD designates a system of ThO_2–UO_2 fuel elements and heavy water currently under investigation in both exponential and critical experiments. The specific object of the THUD program at its outset was to develop the information required for the design of a heavy water–oxide fuel loading for the EBWR. The geometrical buckling for a $\frac{3}{4}$-inch triangular lattice of 25:1 Th to U^{235} fuel rods was determined from a sequence of seven clean criticals. Two independent methods have been employed to establish experimentally the neutron age for the THUD system. Values of the resonance escape probability for the $\frac{3}{4}$ inch triangular lattice have been obtained by fuel and analysis of the fuel substitution experiments. Several experimental determinations have been made of the effective resonance integral for Th and ThO_2. (W.L.H.)

9433 BNL-483(p.73-4)
Los Alamos Scientific Lab., N. Mex.
CRITICALITY DATA ON METAL U^{233} SPHERICAL SYSTEMS. E. A. Plassman and D. P. Wood. p.73-4 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Data consisting of critical reflector thicknesses for 2.41 kg and 10.0 kg U^{233} metal spheres are summarized. Six-group S_4 predictions are compared with observed results for the Oralloy-enriched U and U reflected cases. (W.L.H.)

9434 BNL-483(p.75-6)
Los Alamos Scientific Lab., N. Mex.
REACTIVITY COEFFICIENT DATA ON U^{233} IN FAST CRITICAL ASSEMBLIES. G. E. Hansen. p.75-6 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Data are presented on reactivity coefficient ratios obtained at the centers of Topsy (U reflected Oy), Godiva (Bare Oy), and Jezebel (bare Pu). (W.L.H.)

9435 BNL-483(p.77-83)
American Machine and Foundry Co., Greenwich, Conn.
PHYSICS DESIGN OF THE AMF-CCBR. Otto A. Schulze. p.77-83 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 7p.

The American Machine and Foundry Company has designed a 58-Mw (heat) natural circulation boiling water reactor to operate at 900 psi. Some of the physics design aspects of the core and their influence on the thermal design and on the economics are presented. (W.L.H.)

9436 BNL-483(p.87-90)
National Lead Co. of Ohio, Cincinnati.
THE PRODUCTION OF THORIUM METAL. O. R. Magoteaux. p.87-90 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

The processes used for the production of reactor-grade Th metal fuel elements from $Th(NO_3)_4$ are reviewed. The quality of raw materials and the quality of the metal product are briefly described. Important operating techniques are emphasized. (W.L.H.)

9437 BNL-483(p.91-6)
Lindsay Chemical Co., West Chicago, Ill.
THORIUM ORES AND EXTRACTION OF THORIUM

FROM ORES. Howard E. Kremers. p.91-6 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 6p.

Three kinds of ores are of commercial interest: monazite, thorite-type minerals, and uranium mining by-product thorium. All principal extraction processes involve an initial leach or cooking of the ore with acids or NaOH, followed by appropriate wet chemistry to remove rare earths. The crude Th products so obtained are further purified by classical wet chemical methods or by liquid-liquid extraction to produce commercial Th products such as the nitrate, oxide, or fluoride. (W.L.H.)

9438 BNL-483(p.97-8)
National Lead Co. of Ohio, Cincinnati.
THORIUM REFINING FROM BRAZILIAN SLUDGE CONCENTRATE BY SOLVENT EXTRACTION. S. Cseplo and J. O. Davis. p.97-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

A series of four pilot plant solvent extraction tests was conducted in a 6-inch-diameter column system in order to test the process for Th recovery from Brazilian sludge concentrate and to determine the degree of removal of rare earths, U, and other impurities. In addition, data were obtained on equipment corrosion, column capacities, waste disposal methods, choice of solvent diluent, and method of treatment of solvent. (W.L.H.)

9439 BNL-483(p.99)
Bureau of Mines, Albany, N. Y.
METALLIC REDUCTION OF THORIUM HALIDES. F. E. Block. p.99 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

Thorium tetrachloride is prepared by chlorinating calcined thorium oxalate or nitrate with CCl_4 and is purified of residual oxygen compounds by double vacuum distillation at 800°C. The purified tetrachloride is reacted with Na at 800°C followed by vacuum at 900°C to remove by-product salt and excess reductant. The product is consolidated by vacuum arc-melting to ingot form. (auth)

9440 BNL-483(p.100)
National Lead Co. of Ohio, Cincinnati.
ANHYDROUS THORIUM TETRACHLORIDE PRODUCTION. C. C. Fogel and J. O. Davis. p.100 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

Anhydrous $ThCl_4$ was prepared by packing thorium oxalate in a 6-inch-diameter graphite reactor, heating to 1100 to 1200°F by means of an electrically heated tube furnace, and reacting with gaseous chlorine and CCl_4. Conversion averaged 90% under the preferred operating conditions. (W.L.H.)

9441 BNL-483(p.101)
National Lead Co. of Ohio, Cincinnati.
PREPARATION OF THORIUM METAL BY CALCIUM REDUCTION OF THORIUM OXIDE. S. Cseplo and J. O. Davis. p.101 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

The process for Ca reduction of ThO_2 to Th metal was demonstrated on a 50-lb and 100-lb scale in 10-inch and 14-inch high chrome alloy steel pots. The average over-all yield predicted in production is estimated to be ~90%. (W.L.H.)

9442 BNL-483(p.102-8)
Oak Ridge National Lab., Tenn.
THORIUM PRODUCTION BY THE SODIUM AMALGAM REDUCTION OF THORIUM TETRACHLORIDE. O. C. Dean. p.102-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 7p.

The reduction of thorium tetrachloride by sodium in a mercury medium has many advantages in producing reactor grade thorium economically. All steps in which corrosion of equipment is a factor are carried out at low temperature. All steps up to the elimination of mercury are continuous. The metal is protected from loss and contamination by a coating of mercury during separation from by-products and impurities. The removal of the processing medium (mercury) leaves a nonpyrophoric massive metal which can be safely processed to billets and rods. Two reduction procedures have been developed, either of which could be scaled up to pilot plant level for evaluation. In one, anhydrous thorium chloride is dissolved in propylenediamine before contact with sodium amalgam; in the other, the dry salt is mixed directly with the amalgam. Because the dry system required less equipment and promised more trouble-free operation, it was preferred over the solvent system. Continuous reduction, washing, and vacuum distillation on a scale up to 3.4 lb thorium per hr have been successfully demonstrated. Filter-pressing will require more development to make it a smooth operation. Sponge billets have been extruded directly to rod and evaluated, and have been arc-melted. (auth)

9443 BNL-483(p.109)
Horizons, Inc., Cleveland.
HORIZONS, INC., PRODUCTION OF HIGH PURITY THORIUM METAL BY FUSED SALT ELECTROLYSIS. Bertram C. Raynes. p.109 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

A brief description is given of a process for the production of high-quality Th metal by the continuous fused-salt electrolysis of $ThCl_4$ dissolved in NaCl. (W.L.H.)

9444 BNL-483(p.113-14)
Argonne National Lab., Lemont, Ill.
THE FABRICATION OF THORIA AND THORIA-URANIA. J. H. Handwerk. p. 113-14 [OF] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Additives are presented which aid in the densification of fabricated ThO_2. Thoria–urania mixed crystal bodies were investigated, and it was found that compacts of ThO_2 and U_3O_8 could be formed and sintered in air. (W.L.H.)

9445 BNL-483(p.115)
Argonne National Lab., Lemont, Ill.
EFFECTS OF IRRADIATION ON THORIUM-BEARING

FUELS. J. H. Kittel. p.115 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

The effects of radiation on Th–U alloys and ThO_2–UO_2 ceramic fuels are briefly reported. (W.L.H.)

9446 BNL-483(p.116-18)
Oak Ridge National Lab., Tenn.
REVIEW OF THORIUM METAL PROPERTIES AND THORIUM FUEL PLATE MANUFACTURE. J. Cunningham. p.116-18 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

Data are presented on the tensile properties of Th at room temperature in the arc-cast, wrought annealed, and cold-worked condition. The fabrication of Th into rod, plate, and tubing by various methods is discussed. (W.L.H.)

9447 BNL-483(p.119-20)
Oak Ridge National Lab., Tenn.
CALCINATION OF THORIUM OXIDE FOR SLURRIES AND SUSPENSIONS. C. E. Curtis. p.119-20 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

A wide range of calcination times and temperatures was investigated. Two suspending agents are reported for ThO_2 slurries. The fabrication of ThO_2 ceramics by various methods is discussed. (W.L.H.)

9448 BNL-483(p.121-3)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
HIGH TEMPERATURE IRRADIATION OF THORIUM–URANIUM ALLOYS. C. C. Woolsey. p.121-3 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The fuel slugs used in these experiments were $\frac{3}{8}$-inch diameter by $1\frac{1}{2}$-inch long. Nominal composition was Th with 10 wt. % fully enriched U. The design of the irradiation capsule is shown. Six experimental fuel slugs were irradiated and examined. It is concluded that Th–U alloys of interest for sodium graphite reactors can be operated with central temperatures up to 1250°F, to burnups of the order of $\frac{1}{3}$%, with resulting volume increases of the order of 3%. (W.L.H.)

9449 BNL-483(p.124-5)
Battelle Memorial Inst., Columbus, Ohio.
THORIUM ALLOY SYSTEMS. F. A. Rough. p.124-5 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

A brief review is given of the work performed on thorium alloys. (W.L.H.)

9450 BNL-483(p.126-7)
Sylvania-Corning Nuclear Corp., Hicksville, N. Y.
SUMMARY OF DEVELOPMENT WORK ON THORIUM AT SYLCOR. J. Zambrow. p.126-7 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

A brief description of the development work at Sylcor is presented. The work covered four general phases: production of powder, arc melting, powder metallurgy, and canning. (W.L.H.)

9451 BNL-483(p.131)
Babcock and Wilcox Co., Lynchburg, Va.
U^{233} AND THORIUM FUEL PREPARATION AND RADIATION EXPERIENCE. L. R. Weissert. p.131 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

A brief statement of the status of U^{233} and Th fuel preparation and radiation experience at Babcock and Wilcox is presented. (W.L.H.)

9452 BNL-483(p.132-3)
Oak Ridge National Lab., Tenn.
MOLTEN SALTS AS BREEDER FUELS. W. R. Grimes. p.132-3 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

A brief discussion is presented of status of the Oak Ridge National Laboratory Molten Salt Reactor Program. The preparation and radiation stability of molten salt fuels are described. (W.L.H.)

9453 BNL-483(p.134-7)
Oak Ridge National Lab., Tenn.
THE PREPARATION OF THORIUM OXIDE FOR HR BLANKET SLURRY. D. Ferguson. p.134-7 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

The principal method of preparation of ThO_2 for Tests at ORNL has been the thermal decomposition of thorium oxalate. With this method, the particle size and particle shape may be controlled in the thorium oxalate precipitation, since the oxide retains the particle size of the oxalate. The specific surface area, chemical nature of the surface, and particle integrity are controlled by the firing temperature used for the oxide. (W.L.H.)

9454 BNL-483(p.138-42)
Brookhaven National Lab., Upton, N. Y.
THORIUM SUSPENSION IN LIQUID METALS. Joseph S. Bryner. p.138-42 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 5p.

Suspensions of Th in liquid metals are being considered for use as fluid breeder blanket materials in thermal reactors with a U^{233}–Th^{232} fuel cycle. Several techniques were developed for preparing suspensions of essentially equiaxed intermetallic compound particles in liquid Bi, Pb, or Pb–Bi mixtures. Radiation experience with these fuel systems are reported. (W.L.H.)

9455 BNL-483(p.145-8)
Oak Ridge National Lab., Tenn.
INTRODUCTORY REMARKS ON CHEMICAL REPROCESSING. F. R. Bruce. p.145-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

The chemical reprocessing methods for power reactors employing U^{233} or thorium as fuel and blanket materials are reviewed. (W.L.H.)

9456 BNL-483(p.149-53)
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
THOREX PROCESS DEVELOPMENT AT SAVANNAH RIVER. T. H. Siddall. p.149-53 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION, AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 5p.

Selected topics are discussed in SRL and KAPL development work in the processing of irradiated Th. (W.L.H.)

9457 BNL-483(p.154-6)
Oak Ridge National Lab., Tenn.
PILOT PLANT PROCESSING OF IRRADIATED THORIUM. E. M. Shank. p.154-6 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

A summary is presented of the status of the Thorex program, a review of the process flowsheet as it now stands, a discussion of 30 months of pilot plant operation during the processing of long-decayed and short-decayed thorium, and a summary of the work still required to conclude the development of a short-decay Thorex flowsheet. (auth)

9458 BNL-483(p.157-63)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
EXPERIMENTS IN LOW DECONTAMINATION PROCESSING OF METALLIC THORIUM–URANIUM FUELS. G. E. Brand, E. W. Murbach, and A. G. Buyers. p.157-63 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 7p.

Experiments are being conducted at Atomics International to develop economical methods of reprocessing thorium reactor fuels. Emphasis has been placed on the development of compact low decontamination processes, which yield a relatively small volume of highly radioactive wastes. Although remote fabrication is required for fuel reprocessed by this method, it is felt that this additional cost may be more than offset by savings in the decontamination process. Some of the more promising processes which have been investigated include direct volatilization by arc and induction drip melting, extraction with molten salts, and fused salt electrolysis. One of the difficulties associated with high temperature decontamination of thorium-uranium alloys is containing the molten metal. The experiments were designed to minimize the thorium container contact time at or above the melting point of the alloy. (auth)

9459 BNL-483(p.164)
Los Alamos Scientific Lab., N. Mex.
PRESENT STATUS OF U^{233} PURIFICATION AND METAL PRODUCTION AT LASL. J. A. Kircher. p.164 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

Impure U^{233} nitrate solutions originating from Oak Ridge Thorex product or from metal fabrication residues are separated from trace amounts of thorium isotopes with cation resin. After allowing time for decay of thorium daughters, beta-gamma activity is sufficiently reduced to permit conventional processing in unshielded equipment. The U^{233} is chemically purified by one or more precipitations as uranium peroxide, which is calcined to U_3O_8. The U_3O_8 is reduced to UO_2 and converted to UF_4. Pure metal is prepared by bomb reduction of the UF_4 with calcium as the reducing agent. Residues from the chemical purification steps, reduction, metal fabrication, and general cleanup are processed into nitrate solutions, solvent extracted, and concentrated for recycle. (auth)

9460 BNL-483(p.165-7)
Brookhaven National Lab., Upton, N. Y.
CORE AND BLANKET PROCESSING IN THE LMFR. O. E. Dwyer. p.165-7 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

A proposed process for reprocessing irradiated Liquid Metal Fuel Reactor core and blanket systems is briefly discussed. (W.L.H.)

9461 BNL-483(p.168-71)
Oak Ridge National Lab., Tenn.
PROCESSING OF THE AQUEOUS HOMOGENEOUS REACTOR AND THE MOLTEN SALT REACTOR. D. E. Ferguson. p.168-71 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

A brief description and flowsheet are given for reprocessing homogeneous reactor fuel and blanket slurries. A brief description is also given of the fluoride volatility process which will be used to reprocess fuel and blanket systems of the molten salt reactor. (W.L.H.)

9462 BNL-483(p.175-8)
Los Alamos Scientific Lab., N. Mex.
HEALTH PHYSICS ASPECTS OF HANDLING U^{233} FEED MATERIALS. J. Lawrence. p.175-8 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

Two distinct radiation problems exist in the purification and fabrication of U^{233} feed materials. These are the control of alpha and gamma radiation. All work at Los Alamos Scientific Laboratory with large quantities of U^{233} feed materials is done in dry boxes. The cleaning up after spills, transfer of samples to air from dry-boxes, use of respirators, and determination of U^{233} in air are discussed. (W.L.H.)

9463 BNL-483(p.179-80)
Brookhaven National Lab., Upton, N. Y.
RADIATION HAZARDS IN RECYCLED THORIUM FUELS. Samuel Zwickler. p.179-80 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

The radiation hazards that will exist at high burn-ups are briefly discussed. (W.L.H.)

9464 BNL-483(p.181-2)
National Lead Co. of Ohio, Cincinnati.
RADIATION EXPERIENCE IN HANDLING THORIUM AT FERNALD. R. C. Heatherton. p.181-2 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

Information, observations, and data pertinent to occupational exposure to external radiation from thorium

and to air-borne radioactivity in processing thorium nitrate to produce metal reactor fuel elements are presented. No difficulty was experienced in controlling external radiation exposures to levels well below the recommended maximum permissible, but there was considerable difficulty with the control of air-borne radioactivity. Recommended maximum allowable concentrations were exceeded throughout the latter part of the operating period. (auth)

9465 BNL-483(p.185-7)
Argonne National Lab., Lemont, Ill.
BASIC PHYSICS. W. C. Redman. p.185-7 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The basic physics of the Th–U^{233} cycle is briefly reported. (W.L.H.)

9466 BNL-483(p.188)
National Lead Co. of Ohio, Cincinnati.
THORIUM CRUDES TO FUEL GRADE THORIUM. O. R. Magoteaux. p.188 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 1p.

A brief discussion is presented on production processes for the preparation of both ThO_2 and Th. (W.L.H.)

9467 BNL-483(p.189-90)
Argonne National Lab., Lemont, Ill.
FUEL PREPARATION AND RADIATION EXPERIENCE–SOLID FUELS. J. Schumar. p.189-90 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 2p.

The fabrication and effects of radiation on Th, Th–U alloys, and ThO_2–UO_2 systems are briefly described. (W.L.H.)

9468 BNL-483(p.191-3)
Oak Ridge National Lab., Tenn.
FUEL PREPARATION AND RADIATION EXPERIENCE–FLUID FUELS. R. N. Lyon. p.191-3 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The three forms that fluid fuels may be in and methods of preparing these fuels are briefly discussed. The effects of radiation on these fuels are also briefly reported. (W.L.H.)

9469 BNL-483(p.194-7)
Oak Ridge National Lab., Tenn.
CHEMICAL REPROCESSING. F. R. Bruce. p.194-7 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 4p.

When discussing the chemical reprocessing methods employed for reactors using the thorium-U^{233} cycle, it is convenient to divide the reactors into four categories: nonaqueous fluid fuel reactors, aqueous fluid fuel reactors, thorium-uranium alloy fuel reactors, and ThO_2–UO_2 fuel reactors. In general, reprocessing development of fluid fuel reactors is conducted as an integral part of the reactor system development, and is centered at the site responsible for the reactor. Studies applicable to the reprocessing of thorium-uranium alloy fuel reactors are being carried out at many sites, with pyrometallurgical studies being centered at North American Aviation. Investigations of ThO_2–UO_2 reprocessing methods are being conducted at many sites, but the Oak Ridge National Laboratory has the primary responsibility. (auth)

9470 BNL-483(p.198-200)
Oak Ridge National Lab., Tenn.
FUEL RECYCLE AND HANDLING. E. D. Arnold. p.198-200 [of] THORIUM–U^{233} SYMPOSIUM, SPONSORED BY THE UNITED STATES ATOMIC ENERGY COMMISSION AT BROOKHAVEN NATIONAL LABORATORY, JANUARY 9-10, 1958. 3p.

The problems associated with recycle and handling of thorium and U^{233} can be divided into several categories: reactor irradiation, activity of recovered irradiated thorium and U^{233}, handling of thorium and U^{233} after processing, and allowable or workable specifications for recovered products. The major problems in handling these materials are due to the external gamma hazard from U^{232}–Th^{228} daughters or the internal hazard due to alpha contamination of air. The problem of spontaneous fission or α-n reactions, although present, appears secondary to the others. (auth)

9471 CF-59-2-57
Oak Ridge National Lab., Tenn.
THE NUCLEAR FUEL CYCLE: PROSPECTS FOR REDUCING ITS COST. W. L. Albrecht. Feb. 20, 1959. 15p. Contract W-7405-eng-26. $3.30(ph), $2.40(mf) OTS.

Nuclear fuel cost of 1.25 mills/kwh would make nuclear power competitive with conventional power in low-cost coal areas if capital and operating costs can be brought to within about 10 percent of those of coal-fired plants. Substantial decreases in fuel fabrication cost are anticipated by 1970; other costs in the fuel cycle are expected to remain about the same as at present. Unit costs and irradiation levels that would be needed to give a fuel cost of 1.25 mills/kwh are believed to be attainable by 1970. (auth)

9472 HW-57861
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
NUCLEAR PHYSICS RESEARCH QUARTERLY REPORT [FOR] JULY, AUGUST, SEPTEMBER 1958. Oct. 20, 1958. 34p. Contract W-31-109-Eng-52. $1.00(OTS).

Theoretical Physics. Values are given for the numerical constant C_n in the equation for thermal neutron flux in a nonabsorbing heavy gas medium with a temperature discontinuity. Experimental Nuclear Physics. Errors in previous measurements of the slow neutron fission cross section of Am^{241} made new measurements on a new sample necessary. The new results are given. Critical Mass Physics. Results are given from the approach-to-critical experiments with 3.01 wt. % U^{235} U fuel elements, 0.925-in. outside diam., arranged in light-water moderated and reflected hexagonal lattices of various spacings. Results of buckling calculations for 3%-enriched UO_2 rod–water lattices and 5%-enriched U rod–water lattices are given. The development of a semi-empirical formulation for simplifying calculations of the fast effect for U metal and UO_2 fuel elements in light water is presented. Fuel element enrichment, rod size, and lattice spacing are the variables considered. (For preceding period see HW-56919.) (T.R.H.)

9473 NAA-SR-1517(Rev.)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
TWO-GROUP CALCULATIONS OF THE CRITICAL CORE SIZE OF THE SRE REACTOR. F. L. Fillmore. Jan. 15, 1959. 49p. Contract AT-11-1-GEN-8. $1.25(OTS).

A brief description of the SRE reactor is given. Basic cross sections and other physical data used in the calculations are listed. The required lattice parameters are evaluated, taking into account the details of the lattice cell structure and core structure. Using two-group reflected reactor theory, the critical mass is calculated for three cases. They are (a) dry: all materials at 20°C and no sodium in the reactor; (b) wet: sodium in the reactor and all materials at 180°C; and (c) hot: operating conditions at full power (20 megawatts) with equilibrium xenon and samarium poison. The value for the effective resonance integral of U^{238} used in these calculations was obtained from a two-group analysis of uranium graphite exponential experiments. The calculations described are made in a manner consistent with those made for exponential experiments. The flux and adjoint functions in both radial and axial directions are given. The only fuel considered is 2.778 wt. % enriched uranium metal. (auth)

9474 NAA-SR-2140
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
INTERIM STUDIES OF OMR FOR MARINE PROPULSION. R. E. Stanbridge and R. J. Gimera, eds. Sept. 30, 1957. 74p. Contract AT-11-1-GEN-8. $2.25(OTS).

The results of a four month study program are presented which was directed toward the accomplishment of three specific projects in the development of the Maritime Organic Moderated Reactor. A description of the work performed, conclusions, and recommendations are presented for each of the projects: nonuniformly loaded OMR-type cores, preliminary shielding study, and distillation residue handling. (W.D.M.)

9475 NDA-2072-1
Nuclear Development Corp. of America, White Plains, N. Y.
EFFECT OF PLUTONIUM BUILDUP ON TEMPERATURE COEFFICIENT. W. L. Brooks and H. Soodak. Apr. 1, 1958. 29p. For Yankee Atomic Electric Co. $4.80(ph), $2.70(mf) OTS.

The calculations on the effects of plutonium buildup on the Yankee Power Reactor were reviewed. In addition, the work done at other locations concerning these effects was examined. It was concluded that the Yankee Power Reactor calculations are essentially correct and that work done at other facilities is in agreement in those cases where available data are sufficient to make comparisons. (J.R.D.)

9476 NP-7291
Carolinas Virginia Nuclear Power Associates, Inc., Charlotte, N. C.
PROPOSAL TO THE UNITED STATES ATOMIC ENERGY COMMISSION FOR A POWER DEMONSTRATION REACTOR UNDER THIRD INVITATION FOR NUCLEAR POWER PLANT PROPOSALS BY CAROLINAS VIRGINIA NUCLEAR POWER ASSOCIATES, INC. [1957]. 180p. $33.30(ph), $9.60(mf) OTS.

Issued under a Stone and Webster cover.

As presently contemplated, the proposed reactor will be a vertical pressure tube prototype, moderated and cooled with heavy water and fueled with 2% enriched uranium. An oil fired superheater is to be used for steam delivery of 415 psia and 725°F. This 17 Mwe plant is to be a prototype for the development of a similar nuclear power generating process in a future station of 200 Mwe. Financial arrangements, schedules, etc. are given. (W.D.M.)

9477 NP-7331
Nuclear Products-Erco Div., ACF Industries, Inc., Washington, D. C.
A PROPOSAL FOR A NUCLEAR POWER STEAM GENERATING PLANT FOR THE RURAL COOPERATIVE POWER ASSOCIATION ELK RIVER, MINNESOTA. Jan. 31, 1958. 113p. $19.80(ph), $6.30(mf) OTS.

This proposal was submitted by ACF to the AEC for the design and construction of a 58.2 Mwh boiling water reactor contemplated by the Rural Coöperative Power Association of Minnesota. The reactor is supplemented by a conventional coal-fired superheater of 14.8 Mw capability. The rated output of the system is 225,000 lb/hr of 600 psig, 825°F steam. Preliminary design data and physical concepts which were the basis of plant performance and cost predictions are included. (W.D.M.)

9478 ORNL-2684
Oak Ridge National Lab., Tenn.
MOLTEN-SALT REACTOR PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 31, 1959. Mar. 17, 1959. 128p. Contract W-7405-eng-26. $2.75(OTS).

Reactor Design Studies. A design study is being made of a 30 Mw, one-region, experimental molten-salt reactor. A preliminary design and cost estimate study was completed on a 315 Mw(e) graphite-moderated molten-salt power reactor. The effect of neutron and gamma-ray activity in the secondary heat exchanger of the interim design reactor using the salt mixture LiF–BeF_2 as the coolant, in place of Na, was studied. The nuclear effects of processing molten-salt fuels to remove the rare-earth fission products by ion exchange with CeF_3 were investigated. Investigations have been continued of salt-lubricated bearings for molten salt pumps. The modified Fulton-Sylphon bellows-mounted seal being subjected to an endurance test in a PK-P type of centrifugal pump has continued to seal satisfactorily for more than 10,000 hr of operation. Equipment for salt-to-salt heat transfer tests has been completed. A heat exchanger has been designed with which to evaluate triplex tubing for use in molten-salt or liquid metal-to-steam superheater applications. Further tests of commercial expansion joints in molten-salt lines demonstrated conclusively that such joints are not suitable. Operation of forced-circulation corrosion-testing loops continued. Materials Studies. Examination of three Inconel thermal-convection loops that had operated for long periods of time and one Inconel loop that had operated for 1000 hr have been completed. Mechanical property tests have been made on Inconel and INOR-8 specimens that were carburized by exposure for 4000 hr at 1200°F in a system containing sodium and graphite. Further tests have been made in the study of the compatibility of graphite and molten-salt mixtures. The strength properties of INOR-8 at high temperatures are being investigated in tensile, creep, relaxation, and fatigue tests. Fabrication and welding and brazing studies are being made of triplex-tube heat exchangers. Studies of composites of INOR-8 and type 316 stainless steel have shown the alloys to be compatible at tempera-

tures up to 1800°F. Various means for deoxidizing and purifying ingots of INOR-8 weld metal have been studied as means for improving the ductility of INOR-8 weldments. A Nb-containing coated electrode was investigated for use in joining dissimilar metals. Molybdenum-to-Inconel joints were brazed with several materials in connection with the fabrication of a pump-shaft extension. Chemistry and Radiation Damage. Phase studies are being conducted to determine whether the $NaF-BeF_2-UF_4$ system has any advantages over the $LiF-BeF_2-ThF_4-UF_4$ system. Plutonium trifluoride has been found to be sufficiently soluble in $LiF-BeF_2$ and $NaF-BeF_2$ melts to form a fuel mixture for a high-temperature Pu-burning reactor. The system $KF-LiF-BeF_2$ is being investigated as a possible reactor coolant. Techniques have been developed for determining the self-diffusion coefficients of Cr in Cr–Ni alloys with Cr^{51} as a radiotracer. Vapor pressures of $CsF-BeF_2$ are being measured to obtain values on which to base estimates of the vapor pressure of $LiF-BeF_2$ mixtures. Further studies have been made of gaseous aluminum chloride as a heat transfer medium. Reactor-grade graphite impregnated with $LiF-MgF_2$ has been tested in $LiF-BeF_2-UF_4$ at 1250°F for 800 hr and examined for U penetration. A series of tests was run to determine the effect of thermal cycling on salt stability. Methods have been developed for synthesizing fluorides by reactions with stannous fluoride. Fuel Processing. The solubilities of fluorides of Np, corrosion products, U, and Th, were investigated to evaluate their behavior in the proposed HF dissolution process for recovering $LiF-BeF_2$ salt. (For preceding period see ORNL-2626.) (W.L.H.)

9479 PRDC-TR-17

Power Reactor Development Co., Detroit.

MONTHLY TECHNICAL REPORT [FOR] NOVEMBER 1958. 34p. Contract AT(11-1)-476. $6.30(ph), $3.00 (mf) OTS.

A summary of the first phase of the program directed toward determining the effects of rapid temperature changes on irradiated Zr clad Mo–U fuel pins is presented. It was found that cladding and core rupture occur when the Fermi Reactor fuel pins are heated to 1850°F for short periods. Fuel Engineering. Enriched U scrap is being reprocessed for the CP-5 irradiation program. Materials. Calculations of burnup and irradiation temperatures of cermet samples irradiated in the MTR are tabulated. Samples of irradiated specimens were heated to 1295°F for 100 hours. For any given time at exposure temperatures, fuel density decreases are directly proportional to the square of the burnup. An investigation of the properties of cast boron steel was completed. Although the steel is not ductile and is difficult to weld, it is suitable for shielding. Nuclear Engineering. Phase I of the critical experiment was completed, and an effective delayed neutron fraction was calculated. The maximum and average concentrations of U^{237} that build up with irradiation were calculated for core, axial blankets, and radial blankets. The (n,2n) reaction accounts for the majority of the U^{237} formed. Shielding design for the spent fuel decay facility was completed. Electrical and Instrumentation. The system designed to ensure the proper sequence in fuel handling was manufactured. Liquid Metal and Steam Systems. The pressure, temperature, and thermal stress analyses for steam and water head were completed and set-up for computer analysis. Test Operations. Installation of the leak detector pan, tabular heaters, heater shielding, graphite blocks, insulation, and lagging was completed on the lower and upper reactor vessels. Steam generator tests were conducted, and results are being evaluated. An environmental radioactivity report for the Fermi Reactor site is included, as well as reports for 16 other locations around the reactor. (For preceding period see PRDC-TR-16.) (J.R.D.)

9480 PRDC-TR-18

Power Reactor Development Co., Detroit.

MONTHLY TECHNICAL REPORT [FOR] DECEMBER 1958. 24p. Contract AT(11-1)-476. $4.80(ph), $2.70 (mf) OTS.

The status of the PRDC meltdown studies and the system analysis programs is given. Design and fabrication progress of the major components being procured by APDA for the Reactor Components Test is shown. Progress made by various subcontractors is summarized on fuel engineering, materials, nuclear engineering, reactor vessel engineering, handling, instrumentation, liquid metal and steam systems, and test operation. Environmental radioactivity reports for the Enrico Fermi Reactor are included. (For preceding period see PRDC-TR-17.) (W.D.M.)

9481 WCAP-1096

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

CAROLINAS VIRGINIA NUCLEAR POWER ASSOCIATES CVTR PROJECT MONTHLY PROGRESS REPORT [FOR] JANUARY 16, 1959 TO FEBRUARY 16, 1959. 19p. $3.30(ph), $2.40(mf) OTS.

Progress is reported in fuel element development and design. In-pile experiments and chemistry investigations are summarized. Work on control rod and component development is described. Instrumentation and control, plant system development, plant safety analysis, and critical experiments are discussed. (W.D.M.)

9482 YAEC-97

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

QUARTERLY PROGRESS REPORT FOR THE PERIOD JULY 1 TO SEPTEMBER 30, 1958. R. W. Garbe and H. E. Walchli. 113p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1.

An evaluation and the resulting conclusions of work performed are given for each project in which definitive progress was made. The principle progress consisted of: obtaining promising fuel fabrication results from production scale investigations of simplified UO_2 preparations methods, presintering operation elimination, increasing pellet densities and reductions of UO_2 losses; successfully brazing a ninety-five inch long experimental fuel subassembly in which all joints, including outside ferrules and control rod rubbing strips, had brazed fillets; completing the fabrication of the last group of MTR process water irradiation samples and all of the in-pile test loop samples except for the specimens containing 27% enriched pellets; performing a nuclear analysis of various fuel assembly designs as part of an over-all evaluation of fuel assembly bowing in the Yankee reactor; completing corrosion studies of primary plant materials in static autoclaves to aid in the selection of a pH control agent; developing a "Compromise Design" for the fuel assembly which incorporates a series of small design changes to eliminate the possibility of restricting control rod motion by interference due to a superposition of bowing of the fuel assembly and

an adverse accumulation of mechanical tolerances; completing the calculation of the moderator temperature coefficient, the Doppler temperature coefficient, the void coefficient, neutron lifetime, and delayed neutron fraction; obtaining flux profiles, flux peaking, flux spectrum, peripheral fuel rod worth, void coefficient, temperature coefficient, and control rod worth data from the Critical Reactor Experiments with a 3:1 water-to-uranium metal ratio core at the Westinghouse Reactor Evaluation Center; continuing instrumentation and individual component operational testing of the in-pile test loop; and analyzing the results of the post-irradiation examination of the second group of process water samples and delivery of the last group of samples to the MTR. (For preceding period see YAEC-87.) (auth)

9483 YAEC-119

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

MONTHLY PROGRESS REPORT FOR THE PERIOD JANUARY 1 TO 31, 1959. R. W. Garbe and H. E. Walchli. Feb. 20, 1959. 16p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph), $2.40(mf) OTS.

The work performed or coördinated by the Westinghouse Atomic Power Dept. for the Yankee Atomic Electric Co. during the month of January, 1959 is described. The status for the various tests and component development is given. (For preceding period see YAEC-112.) (W.D.M.)

9484 AEC-tr-3574

TYPES OF ATOMIC POWER STATIONS EXISTING UNDER CONSTRUCTION AND PLANNED IN THE USSR. (Translation). 18p. $3.30(ph), $2.40(mf) JCL or LC.

An analytical report is made on atomic power plants in the USSR. The information was obtained from Soviet open sources (monographs, periodicals, and newspapers). A description is given of various types of industrial and experimental atomic power stations, and reports on the viewpoints expressed by Soviet scientists as to the stability and efficiency of various reactors are given. Graphic material is included. (A.C.)

9485

PROJECT OF A SWISS PROTOTYPE ATOMIC POWER PLANT. Peter Sulzer. Atomenergie 2, No. 4, 24-33 (1958) Dec. (In German)

The design of a Swiss prototype nuclear power plant is described. The reactor will be of the pressure tube type, fueled with natural uranium, and cooled and moderated with heavy water. The 6000 kw nuclear power plant will be combined later with a 30,000 kw nuclear heating plant. A description is given of the reactor construction and the layout of the nuclear power and heating plant. The project is sponsored by Swiss industry. (J.S.R.)

9486

MAKING THE BEST USE OF NUCLEAR FUELS. M. D. Jepson (United Kingdom Atomic Energy Authority). Atomic World 10, 14-17(1959) Jan.

Available reactor fuel systems and their application to different types of reactors are discussed. Consideration is given to the economic aspects of the fuel systems. (J.H.M.)

9487

NUCLEAR STEAM GENERATOR WITH MECHANICAL STEAM–WATER SEPARATING PLANT. (To Babcock & Wilcox Co., New York.) German Patent DAS 1031 899. Atompraxis 5, 42(1959). (In German)

The nuclear steam generator consists of a pressure vessel, a diagonal partition passing through the interior of the pressure vessel, a steam outlet, an exterior chamber, and water cooled and moderated fissionable material in a critical arrangement in an inner chamber. In the vessel a mechanical steam–water separator is provided which absorbs the water–steam mixture from the inner chamber and delivers the separated steam to the outer chamber. By this operation, the largest power density is obtained which is possible with a boiling reactor with natural circulation.

9488

REVIEW OF ATOMIC PROPULSION. Brard. Bull. Tech. Bur. Veritas 40, 179-92(1958) Apr. (In French)

The fundamentals of the fission process and the suitability of the various possible reactor fuels are reviewed. The question of the critical size of a reactor and possible types of reactor for marine propulsion are considered. Fuel utilization and methods for prolonging the life of the fuel rods are discussed. Some details are given on the operation of a reactor. Pressurized water reactors, boiling water reactors, and gas cooled reactors are described in detail, and the subject of shielding is discussed. Other subjects considered include the design of the reactor pressure vessel, piping, and evaporators, and the weight, space required, and costs for the nuclear installation. (auth)

9489

NUCLEAR PLANT ESTIMATING DIFFICULT. J. J. Kearney. Elec. World 150, 72-5(1958) Nov. 17.

All of the various capital and operating costs for a nuclear power plant, particularly fuel costs, vary somewhat from similar costs for a conventional plant. Besides the type of fuel used, its preparation, and disposal of its waste products, the fact that enriched nuclear fuel cannot be bought or sold in the open market, and under most licensing arrangements the user is responsible for the fissionable material, there are other factors which are responsible for these complexities. The cost of nuclear fuel is considered, and a flow chart is given indicating all the various steps in a typical fuel cycle. (auth)

9490

PROJECT FOR MACHINERY OF 65,000 TONS NUCLEAR TANKER. L. Nordstrom and J. Thunell. Int[ern.] Shipbuild[ing] Progr. 5, 365-77(1958) Aug.

The Swedish design project for the machinery of a 65,000-ton nuclear tanker prepared by the Gotaverken shipyard is described in detail. The reactor is of the boiling water type with the steam formed in the core and fed directly to the turbines. The machinery develops 30,000 s.h.p. divided between two propellers. This should give a trial speed of 18.25 knots and a service speed of about 17.75 knots. (auth)

9491

AN ECONOMIC APPRAISAL OF STAINLESS STEEL AND ZIRCONIUM IN NUCLEAR POWER REACTORS. Manson Benedict (Massachusetts Inst. of Tech., Cambridge). Metal. Progr. 75, No. 2, 76-81(1959) Feb.

The results of a study that was made of the relative economics of using Zircaloy or stainless steel in five power-producing thermal reactors are summarized. The reactors were chosen to cover the entire range of U^{235} enrichment in fuel—from natural uranium (0.71% U^{235}) in the NPD Reactor to highly enriched U^{235} (93%

U^{235}) in the General Electric Developmental Boiling Water Reactor. The investigation indicates that Zircaloy instead of stainless steel as structural material, fuel cladding, or fuel in nuclear reactors enables savings to be made through the use of uranium of lower enrichment or reduction in the critical mass. (J.H.M.)

9492

THE ARMY REACTOR PROGRAM. Nucleonics 17, No. 2, 46-9(1959) Feb.

The military and economic advantages of nuclear power for U. S. military installations are discussed. Consideration is given to the proposed uses of nuclear power plants and the military requirements for these plants. Information is included on types and the power output of future Army reactors. (J.H.M.)

9493

APPR-1 OPERATING EXPERIENCE. Nucleonics 17, No. 2, 50-1(1959) Feb.

The operating history of the Army Package Reactor-1 (APPR-1) is reviewed. Information is presented on the performance of the reactors mechanical components and instrumentation. Consideration is given to operating problems such as maintaining water purity and activity buildup. Comparative data are given for the APPR-1 and the APPR-1a. (J.H.M.)

9494

GAS-COOLED PROJECTS. Nucleonics 17, No. 2, 52-3 (1959) Feb.

Information is presented on the design and operating characteristics of facilities for testing experimental reactor cores and gas-turbines-compressor sets. These facilities include the Gas Cooled Reactor Experiment (GCRE) being built at the National Reactor Testing Station and the closed-cycle Gas-Turbine Testing Facility (GTTF) that is under construction at the Army Engineer Research and Development Laboratories, Fort Belvoir. (J.H.M.)

9495

PHYSICAL SIMULATION OF A VARIABLE-REFLECTOR REACTOR. J. J. Stone, Jr., B. B. Gordon, and R. S. Boyd (Batelle Memorial Inst., Columbus, Ohio). Nucleonics 17, No. 2, 93-6(1959) Feb.

The operation of a mockup of a reflector-control system of a boiling-water reactor is described. Design details are discussed and shown schematically. Stability was achieved by inserting baffle plates in the hydraulic coupling. (J.H.M.)

9496

BOILER-SUPERHEATER REACTOR. T. P. Heckman (U. S. Atomic Energy Commission, Lemont, Ill.). Nucleonics 17, No. 2, 97-9(1959) Feb.

Information is presented on a proposed reactor designed to remove heat by both water and steam in independent coolant channels. Moderator-coolant water flows down the center of tubular elements and out the bottom of the reactor; steam flows upward in the spaces between the elements where it is dried and superheated before exiting at the top of the reactor to the turbine. A schematic is included that gives the arrangement of the tubular fuel in the reactor core showing flow paths for steam and moderator-coolant water, plus fuel tube design details. (J.H.M.)

9497

OPERATION SUNRISE. Karl Cohen and E. Zebroski (General Electric Co., San Jose, Calif.). Nucleonics 17, No. 3, 63-70(1959) Mar.

The General Electric Co. boiling water reactor program to achieve competitive nuclear power in the U. S. by 1970 is described. Time-schedule relationships and characteristics of existing and projected plants are given for the three main lines of boiling reactor design: natural-circulation, forced-circulation, and nuclear superheater. The strategy, philosophy, technical objectives, and costs of Operation Sunrise are treated. Information is appended on reactor stability, safety, turbine contamination, failed fuel elements, fuel reprocessing, U. S. boiling-water technology, and cost experience. (T.R.H.)

9498

D_2O REACTOR DEBATE. Nucleonics 17, No. 3, 110-13(1959) Mar.

Project Size-up comments on D_2O reactor economics are summarized and subjected to debate. (T.R.H.)

9499

NUCLEAR PROCESS HEAT EXAMINED. Petrol. Press Serv. 25, 467-8(1958) Dec.

A study of the scope for nuclear process heat in the U.S.A. was recently initiated by the National Planning Association. The scale and grade of process heat used are examined, and examples are quoted of industries in which nuclear heat may be economically feasible. (auth)

9500

R/3 ADAM (SWEDISH NUCLEAR HEAT-ELECTRIC STATION). P. H. Margen and H. Carruthers. Tek. Tidskr. 88, 1077-84(1958) Nov. 11. (In Swedish)

A modified version of the original Adam district-heating station is now to proceed at Farsta, Stockholm. It will be a uranium dioxide fueled, heavy water reactor with initially 10 Mw(e) and 55 Mw(th). After a few years, reactor capacity will be raised from 65 to 125 Mw(th) by inserting further cooling coils. Simultaneously, the turbine will be replaced by a new unit with condenser with, perhaps, an oil-fired superheated, giving 47 Mw(e) with total condensation and 36 Mw(e) when generating 70 Mw(th) for the heating water. Sections deal with possible alternative designs considered, mechanical construction, fuel-handling arrangements, features of the thermal cycle, reactor data, and anticipated operating costs. (auth)

9501

AUTOMATIC WELDING TECHNIQUES SPEED ERECTION OF REACTOR VESSELS. W. A. Davis (Chicago Bridge & Iron Co., Chicago). Welding J. (N. Y.) 38, 125-8(1959) Feb.

Welding positioners and automatic welding techniques for handling and erecting large preassembled sections of containment vessels are discussed. Information is included on the construction of housings for the West Milton Reactor, Enrico Fermi Power Reactor, and Dresden Power Reactor. (J.H.M.)

STABLE ISOTOPE SEPARATION

9502 K-1111(Del.)

Oak Ridge Gaseous Diffusion Plant, Tenn.

MEVAC EXPLORATORY EXPERIMENTS. G. A. Kuipers and D. B. Trauger. June 1, 1954. Decl. with deletions Jan. 15, 1957. 29p. Contract W-7405-eng-26. $4.80(ph), $2.70(mf) OTS.

Exploratory work on the separation of lithium isotopes

by molecular distillation is described. The ideal separation factor of 1.08 was measured in the limit of low evaporation rates, and separation factors ranging from 1.04 to 1.07 were obtained with a laboratory still. The physical properties of lithium and the elevated operating temperatures make necessary special design features and techniques, which are described in some detail. (auth)

9503 K-1112(Del.)
Oak Ridge Gaseous Diffusion Plant, Tenn.
FIRST MEVAC PILOT PLANT. G. A. Kuipers and D. B. Trauger. June 1, 1954. Decl. with deletions Jan. 15, 1957. 40p. Contract W-7405-eng-26. $6.30 (ph), $3.00(mf) OTS.

Lithium isotopes were separated by molecular distillation of metal in an eight stage pilot plant. The distilland was contained in a long horizontal tray 2 ft wide by 16 ft long with 1 to ½ in. side walls. A gable roof condenser with a pitch of one inch from center to either side was welded to the top of the side walls to form the vacuum enclosure. Staging was effected by sheet metal troughs and baffles which formed stages of equal size in a simple cascade. Electric heat and air cooling were used. Erratic stage to stage composition gradients were observed during operation as a result of a deficiency in design. Otherwise the operation was stable and trouble free for a two-month period at distilling temperatures of 520 to 570°C. Stage separation factors of 1.05 to 1.055 were obtained with rates up to 0.3 g/cm^2/hr. Further improvements are discussed briefly. (auth)

9504 K-1220(Del.)
Oak Ridge Gaseous Diffusion Plant, Tenn.
SEPARATION OF LITHIUM ISOTOPES BY MOLECULAR DISTILLATION: SECOND MEVAC PILOT PLANT. J. J. Keyes, Jr., G. A. Kuipers, and D. B. Trauger. June 1, 1955. Decl. with deletions Jan. 15, 1957. 49p. Contract W-7405-eng-26. $7.80(ph), $3.30(mf) OTS.

An improved eight stage molecular still for separating isotopes of lithium is described. This unit incorporates desirable design characteristics of a previous unit, Mevac I, such as, close spacing between distilland and condenser, with a simple stage arrangement permitting gravity flow of distilland. Its special features include a flat condenser surface, improved side and end closures, and elevated distillate flow troughs. Performance of the unit was generally satisfactory, with separation efficiencies at total reflux ranging from 47 to 58%. Stage separation factors varied from 1.052 to 1.064 in the temperature range 627 to 535°C. (Measured distillation rates 0.69 to 0.17 g/(cm^2)(hr)). Corrosion of type 321 stainless steel used in fabrication of the unit was not found to be a serious problem. Certain mechanical limitations resulting in excessive stress concentration in the longitudinal weld seams are recognized, however, and suggestions for a modified design are included. (auth)

9505
A METHOD OF RAPID ELECTROMAGNETIC SEPARATION OF RADIOACTIVE ISOTOPES. Jan Uhler and Torsten Alväger. Arkiv Fysik 14, 473-80(1959).

A method was developed for rapid, electromagnetic separation of μg quantities of solid substances containing activities. A new ion source equipped with two furnaces was built. One of the furnaces, containing some mg of carrier, gives the vapor pressure required for the discharge. The other furnace, which contains the active sample, can be connected to the discharge chamber during separation and be heated rapidly up to 1000°C. Separation of Pb^{212} has given 5% over all efficiency after 7 minutes separation. (auth)

9506
STABLE ISOTOPES: AID TO RESEARCH. Philip S. Baker (Oak Ridge National Lab., Tenn.). Chem. Eng. News 37, 60-5(1959) Feb. 2.

The electromagnetic separation and distribution of stable isotopes by Oak Ridge National Laboratory are discussed. The calutrons (Calif. Univ. Cyclotron) and their operation are described, and the chemical techniques, involving 55 elements, are discussed. (T.R.H.)

9507
SEPARATION OF BORON ISOTOPES IN THE BENCH-SCALE BORON FLUORIDE–ANISOLE UNIT. A. A. Palko (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 121-4(1959) Feb.

A description of the pilot plant procedure and results of boron isotopic separation are presented. The isotopic fractionation was carried out in a boron fluoride–anisole system, which is a gas–liquid, countercurrent exchange process. The system is suitable for production of high-purity boron isotopes. The separation factor, stage height, and decomposition rates are favorable, and operation of the system is relatively simple and economical. Studies indicate that the anisole system is superior to the methyl ether system now in use. (J.R.D.)

9508
THE EXTRACTION OF Hg^{198} FORMED IN GOLD BY IRRADIATION WITH SLOW NEUTRONS IN THE SACLAY P-2 REACTOR. J. Beydon, G. Delmas, J. Druaux and, P. Griboval (C. E. N., Saclay, France). J. phys. radium 19, Suppl., 144A-6A(1958) Dec. (In French)

The extraction by distillation under high vacuum of Hg^{198} obtained from irradiation of Au with slow neutrons was studied. The measurements of extraction efficiency and neutron flux were made by a determination of Hg^{198} contained in gold by the isotopic dilution method. This consists in carrying out a chemical separation of Hg^{198} contained in Au after addition of a known quantity of natural mercury used as carrier, then making an isotopic analysis of the mercury obtained. The results confirm the possibility of extracting the mercury from Au quite completely even when the initial content is as low as 2×10^{-4}. The percentage calculation of Hg^{199} in Hg^{198} is approximately 3% under the conditions of irradiation. It is possible to obtain several tens of mg of this mercury after some months of irradiation in a flux of 2×10^{11} n/cm^2 sec. (auth)

TECHNOLOGY

Feed Materials

Refer also to abstracts 8719, 8720, 8721, 8722, 8723, 8724, 8726, 8727, 9462, and 9464.

9509 K-1367
Oak Ridge Gaseous Diffusion Plant, Tenn.
RECOVERY OF URANIUM HEXAFLUORIDE FROM FEED PLANT VENT GASES. C. C. Littlefield, D. C. Brater, and J. H. Pashley. Mar. 12, 1959. 14p. Contract W-7405-eng-26. $0.50(OTS).

Pilot-plant studies of the use of a fluidized bed of uranium tetrafluoride to scrub small amounts of uranium hexafluoride from feed plant vent gas streams are de-

scribed. No operating problems were encountered, and greater than 90% recovery of the uranium hexafluoride was obtained with bed temperatures of 150 to 500°F. At higher temperatures, however, a loss in recovery efficiency was noted. Gases containing up to 11.5% uranium hexafluoride, 17.0% fluorine, and 10.5% hydrogen fluoride were handled without difficulty; studies were not made at higher concentrations. (auth)

9510 NLCO-721
National Lead Co. of Ohio. Cincinnati.
ELECTROLYTIC OXIDATION OF CHLORIDES IN NITRIC ACID. Wendell S. Miller, Edway R. Johnson, and Robert L. Doyle. June 25, 1958. 34p. Contract AT(30-1)-1156. $1.25(OTS).

An electric process for removing small amounts of chlorides from nitric acid was developed. Process variables were investigated to determine the feasibility of continuous flow cell. (auth)

Raw Materials

Refer also to abstracts 8710, 8711, 8712, 8713, 8714, 8715, 8716, 8717, 8718, and 8726.

9511
CRUSHING AND GRINDING. A Bibliography. London, Her Majesty's Stationery Office, 1958. 433p. $4.90.

The bibliography consists of some 2800 literature references, accompanied by abstracts or annotations, derived mostly by direct reference to original papers and from abstracts by competent authorities. The subject matter ranges from theoretical aspects to health and fire risks of the operations. (W.L.H.)